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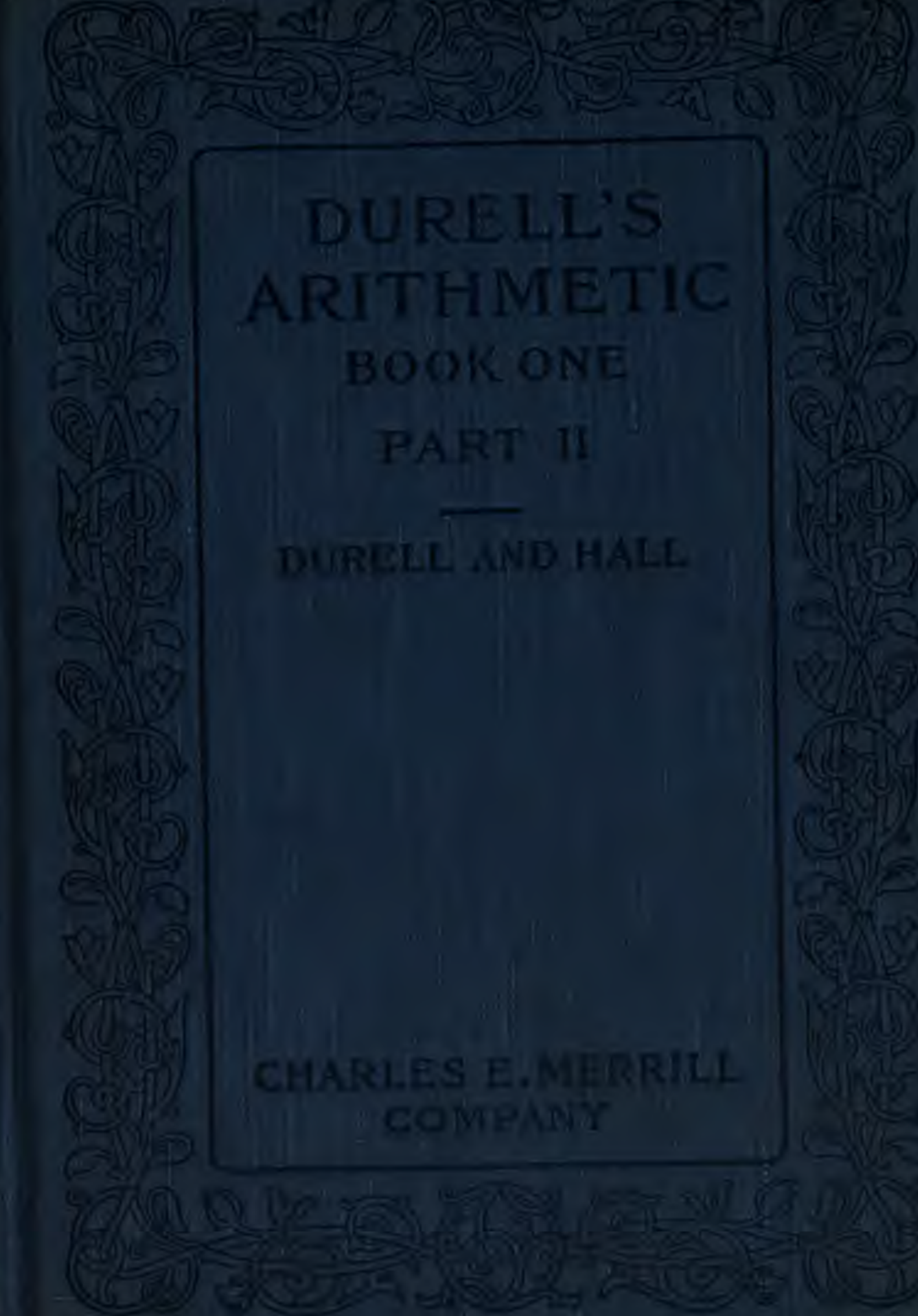

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PART II

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BOOK ONE

PART II

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PREFACE

The main purpose in writing this series of Arithmetics has been to give the subject a broader and more vital practical meaning. By special treatment of the concrete applications of arithmetic, the series develops bread-winning power; and by cultivating a grasp of the functions of number processes, it develops a broad cultural power.

Among the features which contribute to these ends are the *Industry Reviews*, which treat of the arithmetical element in representative industries, as agriculture, mining, and forestry. The *permanent number facts* in geography, history, physics, and other departments have been collected in tables and used repeatedly in examples. These features give a *correlation* of arithmetic with other studies. Furthermore, the examples, especially those devised by the pupil, are often shaped toward some definite, useful end. Such examples add to the broad practical spirit of the books.

The systematic development of principles is a primary aim of the series. All informational matter has been introduced in such a way as not to break up the regular formal development of principles. For instance, the Industry Reviews are each placed at the end of a chapter.

Attention is called to the various special *drills* which, besides their direct value, give variety to the work. In the earlier grades many of these drills take the form of games.

The all-important subject of *review* work has received special attention. In many places the examples call for both written and oral review of important parts of the preceding year's work. This repeated review of preceding work not only gives a more thorough mastery of processes, but in large measure relieves the teacher of the labor of dictating supplementary examples. If the prescribed drills and reviews are followed, practically all the pupils using these books should become rapid and accurate computers.

Much flexibility is possible in the use of Book One, particularly in its earlier parts. The class may begin the work in the book at the middle of Grade I, or at Grade II, or even later, as desired. The teacher will usually introduce informal number work in the first grade orally and from the blackboard. A definite, detailed plan for such work is developed in the *Notes to Teachers* at the end of the Teacher's Edition of Book One and also in Chapters I and II. Obviously, there are very real advantages in following this consistent plan which lays the foundation for the pupil's later work in the text-book.

In general, it is intended that the work for Grade III shall include Chapters III and IV, and that for Grade IV shall include Chapters V and VI.

The course in number study is, as we have indicated, definitely marked out, but the teacher may vary from it in details according to the needs of the pupils and the equipment of the classroom. The work in counting, number sticks, number games, and drills, is so presented that the teacher may increase or diminish it without breaking up the general plan of progression. It is not absolutely necessary to use the problems involving flash cards, number sticks, inch squares, and squared paper, though their use is strongly recommended.

The authors wish to express their special obligation to Dr. A. D. Yocum of the University of Pennsylvania for his valuable investigation of the merits of counting in elementary arithmetic, and his demonstration of the same in the schools of Chester, Pennsylvania. The authors are also greatly indebted to the many primary teachers who have aided Miss Hall in developing the special methods and devices which characterize Book One.

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CHAPTER III

NUMBERS 1 TO 144; ALL THE MULTIPLICATION AND DIVISION FACTS

§ 45. Review

1. Practice counting by 3's to 100. Practice counting to 100 by other numbers less than 10.

2. Give the sum of each number in the lower row with each number in the upper row:

7	3	9	2	4	1	8	5	6
3	7	6	4	2	9	5	8	1

3. Practice giving the primary sums and differences by card drills and number games.

4. Give the product of each number in the upper row by each number in the lower row:

			3	2	1	4	5			
5	4	7	2	9	3	8	6	1	12	11

5. Repeat the multiplication and division tables through those for 5.

6. By use of card drills and number games, review products and quotients, in mixed order.

7. Supply the missing number in each of the following:

$6+7=?$
$7+?=12$
$3\times 2=?$
$6\times ?=18$
$15-9=?$
$24\div 6=?$
$14-?=8$
$?-2=12$
$12\times 3=?$
$9+?=15$
$17-8=?$
$?+4=13$
$2\times ?=22$
$3\times ?=30$
$16\div 8=?$
$5+12=?$

Let the pupil extend this review by writing similar examples on the blackboard.

8. Practice measuring by the pint, quart, and gallon.

9. Practice measuring by the inch, foot, and yard.

10. Fold a square piece of paper to show the meaning of $\frac{1}{2}$, of $\frac{1}{4}$, of $\frac{1}{8}$. Also show $\frac{1}{3}$ and $\frac{1}{6}$.

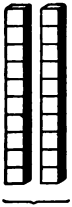
11. How many ounces are there in $\frac{1}{4}$ of a pound? In $\frac{1}{2}$ of a pound? In $\frac{1}{8}$?

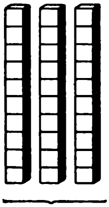
12. Practice weighing sand with the pound weight and smaller weights.

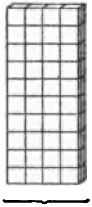
To the Teacher. See Note 23 on Materials for Chapters III and IV (p. 356).

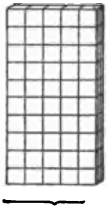
§ 46. Numbers made up of Tens.

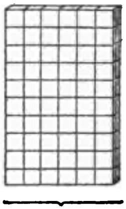
1. Two tens are called what? How many tens in twenty? Which is easiest to write: twenty, or 10 + 10, or 20?

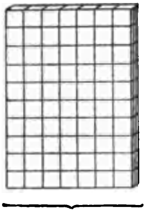

10 + 10
or twenty


Three tens
or thirty

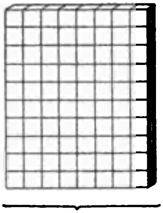

Four tens
or forty


Five tens
or fifty

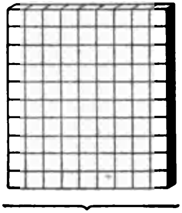

Six tens
or sixty



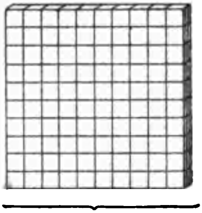
Seven ten's
or seventy



Eight ten's
or eighty



Nine ten's
or ninety



Ten ten's
or hundred

2. Three tens are called what? How many tens in thirty? Which is easiest to write: thirty, or 10 + 10 + 10, or 30?

3. Four tens are called what? How many tens in forty? Which is easier to write: 10 + 10 + 10 + 10, or 40?

4. Five tens are called what? How many tens in fifty? Which is easier to write: 10 + 10 + 10 + 10 + 10, or 50? About how much easier?

5. How many tens in sixty? In seventy? In eighty? In ninety? In one hundred?

6. Write twenty in figures. Fifty. Sixty. Ninety. Thirty. Forty. Seventy. Eighty.

7. Write in words 30, 60, 90, 40, 20, 70, 80, 50.

8. Count by tens from 10 to 100.

9. Count by tens from 100 down to 10.

10. Take 10 splints and tie them together in a bundle. Make another bundle of 10 splints. How many splints in the two bundles? Make another bundle of 10 splints. How many splints have you tied in all?

11. Make 5 more bundles of 10 splints each. How many splints have you in all? Show me 30 splints. 50 splints. 60 splints.

12. James receives 10 cents a day for driving cows to pasture. How much does he earn in a week?

13. I spent 10 cents for ink and 20 cents for paper. How much did I spend in all? If I gave the storekeeper half a dollar, how much change did I receive?

14. How many minutes in half an hour? In one third?

15. If Mary receives 10 cents a day for spending-money, how much will she receive in 6 days? If she gives each of her 2 little brothers 10 cents, how much will she have left?

16. How many cents in 3 dimes? In 7 dimes? 4 dimes? 9 dimes? 8 dimes? 6 dimes?

17. How many days in 10 weeks?

18. Edward received 40 cents for his old books and 30 cents for running errands. How many cents did he receive all together?

19. Susan earned 80 cents, and spent 10 for candy and 30 for calico and 10 for pens. How many cents did she have left?

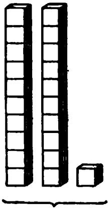
§ 47. Numbers made up of Tens and Ones

1. Count by ones from 20 to 30.

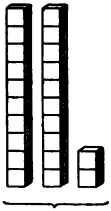
2. Which is easiest to write: twenty-one, or 20 + 1, or 21?

3. Show by splints the numbers from 24 to 29.

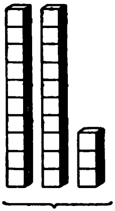
4. Count by ones from 30 to 40. From 40 to 70. From 70 to 100.



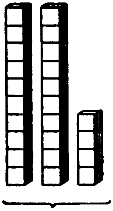
Twenty and one
or twenty-one
20 + 1 or **21**



Twenty and two
or twenty-two
22



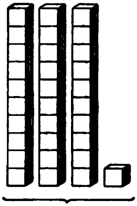
Twenty-three
23



Twenty-four
24

5. Count by ones from 40 down to 30. From 70 to 40.

6. In 32, how many tens are there? How many ones?



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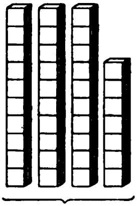

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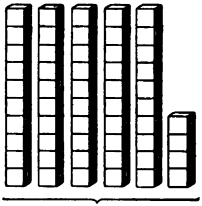

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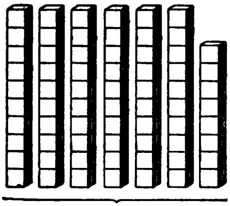

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7. In 47 cents, how many dimes? How many cents? In 47, does 4 stand for the number of dimes or of cents? Which does 7 stand for?

8. In 37, if the figure 3 stands for sticks of candy and 7 stands for sticks of candy, which would you rather have: the sticks of candy that 3 stands for, or those that 7 stands for?

Principle

In any number of two figures the **right-hand** figure stands for **units**, and the **left-hand** figure stands for **tens**.

9. In 85, how many tens and how many units are there?

10. Tell how many tens and how many units are in 37. In 52, 65, 83, 70, 22, 40, 90, 91.

11. Write in words 23, 42, 56, 71, 82.

12. Express in figures thirty-four, sixty-two, fifty-seven, ninety-four, forty-five, eighty-six.

13. Which is easier to write: three tens and four units, or 34?

14. Sarah has three dimes and seven cents. How many cents has she in all? Write this on your paper.

15. Robert received 40 cents for picking strawberries, and 3 cents for hunting eggs. How many cents did he get all together?

16. Which is larger: 28 or 82? Why? 14 or 41?

17. Which is larger: 81¢ or 39¢? 71 or 69?

18. What is the first number after 13 that ends in 9? After 29 that ends in 2?

19. Count by tens from 13 to 93. From 11 to 91. From 19 to 99.

20. Write the number which is 10 more than 27. 10 more than 56. 20 more than 73.

21. Make a larger number out of the figures in 37.

22. Fix in mind the number names up to 100, and the figures which stand for them, by playing some number game.

§ 48. Counting by 1's, 2's, and 3's; Addition by Decades

1. Count by 1's from 1 to 100. From 100 to 1.

2. Count by 2's from 2 to 100. From 100 to 2. Also by 2's from 1 to 99, and reverse the counting.

To the Teacher. Any part of the counting in Exs. 1 and 2 with which the pupils are thoroughly familiar may be omitted.

3. Combine 7 + 6 into one number by counting 6 on to 7 thus: 7, 8, 9, etc., to 13. Now say, "7 and 6 are 13." Which is easier?

4. When we say "7 + 6 = 13," we *add.* We call 13 the *sum.*

Definitions

The **sum** of two or more numbers is the number which they equal when taken together.

Addition is a short way of finding the sum of two or more numbers.

The **addends** are the numbers added.

Thus, in 7 + 6 = 13, 13 is the sum. 7 and 6 are the addends.

To get the sum 13, we do not go through the long way of counting 6 on to 7; we find this sum by the short process of memory.

5. Add:

5	15	25	35	45	55	65	75	95	85
2	2	2	2	2	2	2	2	2	2

6. Charles had 26 pigeons, and 2 more came to his pigeon house last night. How many has he now?

7. Add 19 + 2 by the use of splints.

Take 19 splints (10 splints in a bundle and 9 single splints). Add 2 splints. You now have a bundle of 10 splints and another of 11 splints, or 2 tens and 1 splint, or 21 splints.

8. Now add:

19	29	39	59	89	79
2	2	2	2	2	2

9. Add 18 + 2 by the use of splints as in Ex. 7.

10. Now add:

18	28	38	68	78	48	58
2	2	2	2	2	2	2

11. Mary found 19 eggs this morning and 2 this afternoon. How many eggs did she find in all?

12. If we had 29 apple trees in our orchard and planted 2 more, how many would we then have?

13. Our school had 39 pupils. Two more came on Tuesday, and 2 more on Wednesday. How many pupils were then in our school?

14. John had 9 cents and Joseph had 19 cents. Their father gave them each 2 cents more. How many cents did they each have then?

15. Add 41 cents and 12 cents.

We write the work thus:
41 cents
12 cents
53 cents

Instead of counting 12 cents on to 41 cents, or trying to remember all the sums of 2-figured numbers, we add the numbers part by part, first the units and then the tens. Thus: 1 cent + 2 cents makes 3 cents (which we write). 4 dimes + 1 dime makes 5 dimes (which we write).

In adding we place units under units; tens under tens. We add the units and set the result under the units; then add the tens and set the result under the tens.

16. Add:

53 ¢	44 ft.	75 lb.	23	64	75
12 ¢	21 ft.	11 lb.	12	22	10

17. We have 53 chickens in one yard and 22 in another. How can we tell how many we have in all, without putting them together and counting them?

18. Count by 3's from 3 to 99. Also from 99 to 3.

19. Count by 3's from 1 and 2 with 100 as a limit; reverse each counting.

20. Add:

16	26	56	76	96	54	75	46 ¢
3	3	3	3	3	32	23	13 ¢

21. Which is greater: 92 or 29? Why?

22. Make the largest number you can with the figures 2 and 7.

23. Review the primary sums by use of flash cards.

§ 49. Subtraction by Decades; Liquid Measures

1. Count again by 1's, 2's, and 3's to 100, and reverse the countings.

Definitions

Subtraction is a short way of finding how many are left after we take away a smaller number from a larger.

The **difference** (or **remainder**) is the result of the subtraction.

Thus, 7 – 3 = 4 is a subtraction, and 4 is the difference, or remainder.

Sometimes it is best to think of subtraction as the process of finding what number must be *added* to a given smaller number to make a given larger number.

Thus, in 7 – 3 = 4, we find a number, 4, which added to 3 makes 7.

2. Combine 11 – 6 into one number by counting off 6 from 11 thus: 11, 10 . . . to 5. Now say, "11 less 6 are 5." Which is easier? This shows that subtraction is easier than counting backward.

3. Subtract:

5	15	25	85	16	36	76	7	77	87
2	2	2	2	1	1	1	2	2	2

37	47	18	28	38	88	59	45	67¢	$87
2	2	2	2	2	2	2	22	21¢	$12

4. Henry brought 23 apples from the orchard this morning, and his mother gave him 2 of them to eat. How many apples did she keep?

5. Mr. Miller took 67 watermelons from his patch this morning; he brought home 2 to eat and sold the rest. How many did he sell?

6. Subtract 2 from 21 by the use of splints.

From 21 splints (2 bundles of 10 splints each and 1 splint) we subtract 2 splints (by undoing one of the bundles and then taking away 2 splints). How many splints are left?

7. Subtract:

11	21	31	41	51	91
2	2	2	2	2	2

8. Subtract 2 from 20 by the use of splints, as in Ex. 6.

9. Subtract:

12	22	32	40	60	90
2	2	2	2	2	2

10. Subtract:

15	25	85	22	42	51	60
3	3	3	3	3	3	3

11. Lawrence had 21 cents, and spent 2 cents for a pencil. How many cents did he have left?

12. Martha worked 22 examples, of which 3 were wrong. How many were right?

13. Mrs. Appleton had 81 chickens, of which 3 died last night. How many has she now?

14. Marcus had 3 dimes, and spent 2 cents for an orange. How many cents has he now?

15. Subtract 14 cents from 46 cents.

We write the work thus: 46 cents
14 cents
32 cents

Instead of counting backward or trying to remember all the differences of 2-figured numbers, we subtract the numbers, part by part, first the units and then the tens. Thus: 4 cents from 6 cents leaves **2** cents (which we write). 1 dime from 4 dimes leaves **3** dimes (which we write).

In subtracting, we place units under units, tens under tens. We subtract the units and set the result under the units; then subtract the tens and set the result under the tens.

16. In a school of 38 pupils, 17 are girls. How many boys are there?

17. Subtract:

55¢	44 ft.	65 lb.	23	74	36
12¢	21 ft.	22 lb.	12	34	10

PINT

QUART

GALLON

18. Copy and read the following table:

Measures

2 pt. = 1 qt.
4 qt. = 1 gal.

19. Which is easier for the grocer: to use the gallon measure once, or the quart measure four times?

20. Name some articles that are bought by the pint. By the quart. By the gallon.

21. If I have a gallon measure full of milk, and take out 1 qt. and 1 pt., what is left?

22. 2 gal. 1 qt. = ? ? qt. = 12 pt. 16 pt. = ? gal.
16 qt. = ? gal. 7 qt. = ? pt.

§ 50. Counting, Addition, and Subtraction with 4, 5, and 6

1. Count by 4's from each of the numbers 3, 2, 1 with 100 as a limit, and reverse.

2. Count by 5's from 1, 2, 3, 4 with 100 as a limit, and reverse.

3. Count by 6's from each number smaller than 6 with 100 as a limit, and reverse.

To the Teacher. Part of this counting may be omitted or distributed in other places (often taught earlier) at the discretion of the teacher.

4. Add:

3	13	23	63	73	7	17	27	57	87
4	4	4	4	4	4	4	4	4	4

5. In Ex. 4 change 4 in each example to 5 and add. Then change to 6 and add.

6. Subtract:

7	17	27	47	87	11	21	31	41	71
4	4	4	4	4	4	4	4	4	4

7. In Ex. 6 change 4 to 5, then to 6.

8. Roger earned 27 cents by picking berries and 5 cents by running errands. How much did he earn in all?

9. George found 34 apples under one tree and 15 under another. How many did he find in all?

10. Mary had 21 cents, and spent 4 cents for a spool of thread. How many cents has she now?

11. Laura had 28 examples to work, and has worked 16 in school. How can she tell how many she will have to work to-night, without counting them?

12. It is 19 miles from Philadelphia to Bristol, and the train has gone 11 miles. How far has it to go?

13. Carl earned 13 cents by picking berries one day, 22 cents the next, and 31 cents the third day. How much did he earn in the three days?

14. Anna had 13 cents and Louise 23 cents. Each spent 5 cents for soda water. How many cents did each then have?

Definition

A **square** is a rectangle where the sides are equal.

15. Draw a square inch (you may use your squared paper as a help).

16. On squared paper mark off and cut out a square, each side of which is 2 inches. How many square inches does it contain?

17. Fold it through the middle to show halves. Fold

it again to show fourths. Fold it again to show eighths. How many halves in 1? How many fourths in 1? How many eighths in 1?

18. On squared paper mark off and cut out a square, each side of which is 3 spaces long. Fold it so as to show thirds. Also to show ninths.

19. Cut out another square the same size. Fold it so as to show thirds. To show sixths. Also to show twelfths.

20. Name as many square spaces or objects in the room as you can. Measure them to see if you were right in calling them square.

21. What is a square foot? Mark out one on the blackboard or floor.

§ 51. Counting, Addition, and Subtraction with 7, 8, 9

1. Count by 7's from each number less than 7 with 100 as a limit, and reverse.

2. Count by 8's and 9's in the same way.

3. Add:

8	18	38	78	58	39	69	49	69
7	7	7	7	7	8	8	8	8

24	44	84	70	78	75	37	67	38¢
9	9	9	9	9	7	8	12	41¢

4. Subtract:

8	18	38	98	78	12	22	34	64
7	7	7	7	7	8	8	8	8

13	23	83	61	72	66	78	58¢	36¢
9	9	9	8	9	6	36	27¢	23¢

5. James had 42 pigeons at the beginning of March, and 7 more at the end of the month. How many did he then have?

6. A newsboy bought 27 *Heralds* and 9 *Gazettes*. How could he tell how many papers he then had, without counting them?

He then sold 12 papers. How many did he have left?

7. Philip had $ 18 in the savings bank on New Year's Day, and saved $ 31 during the year. How many dollars did he have at the end of the year?

8. My cyclometer now reads 81 miles, and I have ridden 7 miles to-day. What must my cyclometer have read this morning?

9. Walter had 47 sheets of writing paper, and has used 21. How can he tell how many he has left, without the trouble of counting them?

10. Mrs. Havens had 38 chickens and sold 17. How many were left?

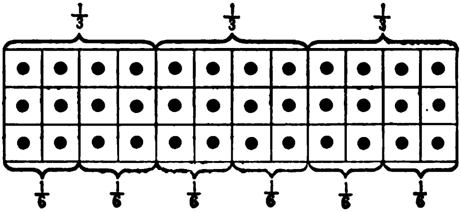
11. Helen found 28 pears under the tree this morning; she gave Harriet 3 and Caroline 4. How many did she have left?

12. Fold a small square piece of paper to show thirds. Fold again to show sixths. On the folded paper, show that $\frac{2}{6}=\frac{1}{3}$. Show, also, that $\frac{4}{6}=\frac{2}{3}$. Show that $\frac{3}{6}=\frac{1}{2}$.

13. On squared paper mark off a rectangle 12 spaces long and 3 spaces wide. How many squared spaces does it contain?

$\frac{1}{3}$ of it contains how many? $\frac{1}{6}$ contains how many? $\frac{2}{6}$ how many? Does $\frac{2}{6}$ (of 36) $= \frac{1}{3}$ (of 36)?

Make a large dot in each small space, and show that $\frac{2}{6}$ (of 36 dots) $= \frac{1}{3}$ (of 36 dots).



14. In the same manner as in Ex. 13 show that $\frac{2}{6}$ (of 48) $= \frac{1}{3}$ (of 48). Also $\frac{3}{6} = \frac{1}{2}$. $\frac{4}{6} = \frac{2}{3}$. Also show that $\frac{6}{8}$ (of 48) $= \frac{3}{4}$ (of 48).

15. Fold a small square piece of paper to show halves. Fold again to show fourths. Fold again to show eighths. By this folded paper show that $\frac{2}{4} = \frac{1}{2}$. Show also that $\frac{6}{8} = \frac{3}{4}$.

16. Add:

35	61	50	32	\$51	22¢
13	37	21	26	28	36
21	11	27	30	20	31

§ 52. Measuring Time

1. How many hours are there in a day?

2. How many hours in half a day? In $\frac{1}{4}$ of a day?

3. How many hours from noon to midnight? From midnight to noon?

4. What does 7 A.M. mean? 7 P.M.?

5. How many hours are there from 9 o'clock in the morning to 4 o'clock in the afternoon? Also from 9 A.M. to 4 P.M.?

6. How many hours are you in school in 1 day? In 1 week?

7. How many months are there in a year?

Measures

12 months = 1 year.

This is shortened to 12 mo. = 1 yr.

8. How many months in half a year? In $\frac{1}{4}$ of a year? In $\frac{1}{3}$ of a year?

9. The months of the year with the number of days in each are

January	31	May	31	September	30
February	28 (or 29)	June	30	October	31
March	31	July	31	November	30
April	30	August	31	December	31

Find out in what short way January is written. Find out the short way of writing the other long names in the list of months.

10. Name the spring months. The summer months. The autumn months. The winter months.

11. How many days are there in the spring months taken together? In the summer months? In the autumn months? In the winter months?

12. Commit to memory the following:

Thirty days hath September,
April, June, and November,
All the rest have thirty-one,
Excepting February alone,
To which we twenty-eight assign,
Till leap year gives it twenty-nine.

13. Read and copy the following:

14. Review previous countings.

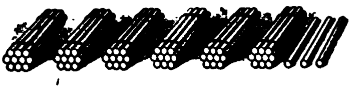
Measures

24 hr. = 1 da.
7 da. = 1 wk.
12 mo. = 1 yr.

§ 53. Addition; Sum of a Column Greater than 10; Carrying

1. Add 36 splints and 27 splints.

36 splints = 3 ten-bundles + 6 splints
27 splints = 2 ten-bundles + 7 splints
63 splints = 5 ten-bundles + 13 splints
= 5 ten-bundles + 1 ten-bundle + 3 splints
= 6 ten-bundles + 3 splints



Let the pupil put in one place on the table 3 bundles of ten splints each and 6 splints. Let him put in a place nearer him 2 bundles of ten splints each and 7 splints. Let him draw a line still nearer him, and then combine the two lots of splints. 7 splints and 6 splints make 13 splints, or 1 bundle of ten splints and 3 splints. Hence he will have 6 bundles of ten splints and 3 splints, or 63 splints, as the sum.

2. Add 36 cents and 27 cents.

$$\begin{array}{l}
36\text{¢} = 3 \text{ dimes} + 6 \text{ cents}\\
27\text{¢} = 2 \text{ dimes} + 7 \text{ cents}\\
\hline
63\text{¢} = 5 \text{ dimes} + 1 \text{ dime} + 3\text{¢},\\
\qquad\quad \text{or } 6 \text{ dimes} + 3\text{¢},\\
\qquad\quad \text{or } 63\text{¢}
\end{array}$$

3. Add 36 and 27.

$$\begin{array}{l}
36 = 3 \text{ tens} + 6 \text{ ones}\\
27 = 2 \text{ tens} + 7 \text{ ones}\\
\hline
63 = 5 \text{ tens} + 1 \text{ ten} + 3 \text{ ones},\\
\qquad\quad \text{or } 6 \text{ tens} + 3 \text{ ones},\\
\qquad\quad \text{or } 63
\end{array}$$

4. Add by use of splints:

$$\begin{array}{ccccc}
38 & 29 & 57 & 36 & 45\\
\underline{15} & \underline{23} & \underline{13} & \underline{29} & \underline{17}
\end{array}$$

While some pupils work at their seats with splints, let other pupils at the blackboard express each step of the process in figures.

5. Add:

$$\begin{array}{ccccc}
28\text{¢} & 33\text{¢} & 28\text{¢} & 29\text{¢} & 36\text{¢}\\
\underline{15\text{¢}} & \underline{19\text{¢}} & \underline{12\text{¢}} & \underline{16\text{¢}} & \underline{14\text{¢}}
\end{array}$$

6. Add:

$$\begin{array}{cccccc}
\$62 & 34 & 35 & 27 & 17 \text{ boys} & 63 \text{ girls}\\
\underline{\$19} & \underline{27} & 19 & 11 & 52 \text{ boys} & 10 \text{ girls}\\
 & & \underline{24} & \underline{19} & \underline{15 \text{ boys}} & \underline{12 \text{ girls}}
\end{array}$$

7. Bertha found 27 eggs one day and 26 the next. How many eggs did she find in all?

8. Carl earned 13 cents by picking berries one day, 24 cents the next day, and 19 cents the third day. How many cents did he earn in three days?

9. Caroline worked 11 examples on Monday, 10 on Tuesday, 15 on Wednesday, 17 on Thursday, 21 on Friday. How many did she work during the week?

10. James spent 28 cents for a ball, 35 cents for a bat, and 25 cents for a glove. How much did he spend in all?

11. On Arbor Day our school planted 17 trees in front of the schoolhouse one year; 12 trees behind it the next; and 23 along the road the third year. How many trees did we plant in the three years?

12. How many inches are there in a foot? How many feet in a yard?

If we contract *inches* into *in.*, *feet* into *ft.*, and *yard* into *yd.*, we may write

Copy and read this table:

Measures

12 in. = 1 ft.

3 ft. = 1 yd.

13. Write in a shorter way, twelve feet and five inches. Also 9 feet and seven inches.

14. How many inches in 1 ft. 5 in.? In one foot and $\frac{1}{4}$ of a foot?

15. Mark on squared paper a rectangle 9 spaces long and 5 spaces wide. If each space of length stands for 1 yd., how many yards does the length of the rectangle represent? How many does its width represent?

16. Mary has a flower plot 8 ft. long and 4 ft. wide. $\frac{1}{2}$ of the plot is planted with roses, $\frac{1}{4}$ with pinks, and $\frac{1}{4}$ with pansies. Make a drawing of this plot which Mary can send to her friend in a distant city.

17. If there are 47 rooms in the Ocean View Hotel, and 23 of these are occupied, how can the manager of the hotel tell how many vacant rooms he has, without the trouble of counting them?

18. Review the multiplication tables through 5's.

19. Review multiplication and division facts, using the flash cards.

§ 54. Subtraction

1. From 53 splints subtract 26 splints.

$$\begin{array}{lr}
53 \text{ splints} = 5 \text{ ten-bundles} + 3 \text{ splints} = & 4 \text{ ten-bundles} + 13 \text{ splints} \\
\underline{26} \text{ splints} = & 2 \text{ ten-bundles} + 6 \text{ splints} \\
\cline{2-2}
27 \text{ splints } \textit{Difference} & 2 \text{ ten-bundles} + 7 \text{ splints,} \\
 & \text{or } 27 \text{ splints}
\end{array}$$

Notice that 1 ten-bundle is taken from the tens and added to the 3 splints, making 13 splints.

Let the pupil perform this subtraction by actual use of the splints. The number to be subtracted, 26 splints, is taken by the pupil from the 53 splints on the table, leaving 27 splints.

2. From 53 cents subtract 26 cents.

$$\begin{array}{lr}
53 \text{ cents} = 5 \text{ dimes} + 3 \text{ cents} = & 4 \text{ dimes} + 13 \text{ cents} \\
\underline{26} \text{ cents} = & 2 \text{ dimes} + 6 \text{ cents} \\
\cline{2-2}
27 \text{ cents } \textit{Difference} & 2 \text{ dimes} + 7 \text{ cents,} \\
 & \text{or } 27 \text{ cents}
\end{array}$$

Let the pupil perform the work of Ex. 2 by the use of actual coin.

3. **From** 53 subtract 26.

$$\begin{array}{ll} 53 = 5 \text{ tens} + 3 \text{ units} = & 4 \text{ tens} + 13 \text{ units} \\ \underline{26} = 2 \text{ tens} + 6 \text{ units} = & \underline{2 \text{ tens} + 6 \text{ units}} \\ 27 \textit{ Difference} & 2 \text{ tens} + 7 \text{ units,} \\ & \qquad\quad \text{or } 27 \text{ units} \end{array}$$

4. Subtract by the use of splints:

33	43	37	40	51	62	80
16	27	19	12	22	29	49

Let some pupils express each step of the process in figures on the blackboard.

5. Subtract:

83	79	65	70¢	$57	43 marbles
12	26	27	23¢	$14	19 marbles

6. In Ex. 5, read the examples in which you have to take a ten from the tens' column to add to the units.

7. Oscar earned 63 cents during the week and spent 24 cents. How many cents did he have left to put in the savings bank?

8. This year our baseball team played 42 games in all. Of these games 27 were played at home. How many were played away from home?

9. Robert weighed 57 pounds on one birthday and 63 pounds on his next birthday. How many pounds did he gain during the year?

10. Mr. Howard had 67 sheep in a field and drove out 29 of them. How many did he have left? He then drove in 18 sheep. How many were in the field at last?

11. Make and solve 5 examples in which you draw on the tens' column; 5 examples in which this is not done.

12. Mrs. Ames sold eggs at the store for 79 cents, and bought 3 spools of thread at 6 cents a spool. How much money did she have left?

13. Sarah had 4 dimes and 9 cents, and bought 12 cents' worth of one kind of paper and 15 cents' worth of another kind. How much money did she have left?

14. Name the months of the year.

15. How many days are there in the 3 winter months?

16. How many more days in the 3 summer months than in the 3 winter months together?

17. Is this piece of string longer or shorter than a foot?

18. Measure it with the foot rule. How many inches shorter or longer is it than you supposed?

19. Go to the blackboard without a rule and draw a line which you think is a foot long. Measure your line.

20. Draw on the blackboard a line which you think is a yard long. How many feet should this be? Measure it and see how much too long or too short your line is.

21. Draw a line which you think is $\frac{1}{2}$ foot long. Measure it.

22. Read and write the table of measures of length.

23. Review counting forward by 7's, 8's, and 9's. Count backward with the same numbers.

24. If you had two dimes with which to buy a lunch, tell how you would spend them.

§ 55. Review; Drill Work in Addition and Subtraction

1. Add up and down and also across:

(*1*)
4 + 6 + 3 + 2 + 5 =
3 + 5 + 1 + 6 + 4 =
1 + 3 + 5 + 4 + 5 =
5 + 2 + 4 + 3 + 6 =
2 + 5 + 6 + 4 + 3 =
? ? ? ? ?

(*2*)

6	5	7	9
8	6	5	7
5	9	7	8
7	8	6	5

Let the teacher or pupil place similar examples on the blackboard for rapid oral work.

2. First add and then subtract:

17	27	47	67	37	57	87	77
9	9	9	9	9	9	9	9

18	38	58	28	68	48	88	78
9	9	9	9	9	9	9	9

3. In Ex. 2 in place of 9 use 6, 7, and 8 in succession.

Let the teacher or pupil place similar examples on the blackboard for drill work.

4. Add:

44¢	34	17	$ 56	27
32	55	34	24	43
45	23	25	18	35

5. First add and then subtract:

37¢	56 apples	$ 74	42 qt.	81 marbles
18¢	27 apples	$ 36	25 qt.	39 marbles

Let the teacher or pupil put on the blackboard examples similar to Exs. 4 and 5 for drill work.

6. Tell the sum of

Four 10's and six ones
Five 10's and three 10's
Six 10's and five 10's
Seven 10's and six 10's
Eight 10's and eight ones
Nine 10's and five ones

7. Tell the sum of

30 and four 10's
33 and five 10's
60 and seven 10's
15 and nine 10's
30 and six 10's
Four 10's and 23.

8. Tell the difference between

111 and seven 10's
132 and six 10's
99 and five 10's
141 and nine 10's
140 and eight 10's
100 and three 10's

9. What is the sum of 2 half-dollars, 1 quarter, 4 dimes, and 1 nickel?

10. Ralph earned 25¢ weeding a garden, 16¢ feeding some chickens, and 12¢ for going on an errand. How much did he earn all together?

11. Mary saved 45¢ in November and spent 17¢ for Christmas pictures. How much had she left?

12. Mrs. Andrews had 41 turkeys and sold 12 of them. How many did she have left?

13. Make, and work, ten single-column examples in addition, the sum in each case not to exceed 50.

14. Subtract 25 different numbers from 50.

15. Review all the primary sums and differences by using flash cards.

§ 56. Review of Multiplication and Division Tables for 2, 3, 4, and 5

1. Add each of the following columns:

2	3	4	5	4	2	5	3
2	3	4	5	4	2	5	3
2	3	4	5	4	2	5	3
2	3	4	5	4	2	5	3
2	3	4	5	4	2	5	3
				4	2	5	3

2. Can you get the sum of each of these columns in any shorter way than by adding?

3. Repeat the multiplication tables for 2, 3, 4, and 5.

4. Tell how many are

3 × 2	8 × 5	12 × 3	9 × 3
6 × 4	7 × 4	11 × 4	8 × 2

2 ¢	$ 4	3 apples	5 ¢	$ 4	5 books	4 boys
× 6	× 7	× 9	× 9	× 6	× 11	× 9

5. Tell how many are

6 ÷ 3	12 ÷ 4	15 ÷ 5	24 ÷ 4
6 ÷ 2	12 ÷ 3	15 ÷ 3	36 ÷ 3
3)18	3)15	$\frac{1}{3}$ of 21	$\frac{1}{4}$ of 36
2)18	$\frac{1}{2}$ of 14	$\frac{1}{5}$ of 25	$\frac{1}{3}$ of 36

6. Review the multiplication tables for 2, 3, 4, 5 by a "time race" to see which pupil can give these tables in the shortest time. Review the division tables in the same way.

7. Count by 3's from 3 to 36. By use of inch squares, build a rectangle at the same time.

8. On the rectangle show how many 3's are in 9. In 12. In 24. In 18. In 21. In 27.

Also show how many square inches in $\frac{1}{3}$ of 36 square inches. In $\frac{1}{6}$ of 36. In $\frac{1}{2}$ of 36. In $\frac{2}{3}$ of 36. In $\frac{2}{6}$ of 36. In $\frac{1}{4}$ of 36.

9. On squared paper mark off a rectangle 3 inches wide and 12 inches long. Which is easier: to mark off this rectangle, or to build a rectangle as in Ex. 7?

10. On the rectangle you have marked, show how many 3's in 9. In 18. In 24. Also show how many squares in $\frac{1}{3}$ of 36.

11. On squared paper mark off a rectangle 4 inches wide and 12 inches long. On this rectangle show how many 4's in 12. In 16. In 48. In 36.

Show how many square inches in $\frac{1}{3}$ of 48 square inches. In $\frac{1}{4}$ of 48. In $\frac{1}{6}$ of 48.

12. If Martha receives 2 cents for picking 1 quart of strawberries, how many cents will she receive for picking 5 quarts? 7 quarts? 12 quarts?

13. If 1 pound of sugar costs 4 cents, what is the cost of 6 pounds? 8 pounds? 10 pounds? 7 pounds?

14. If 1 pencil costs 3 cents, what is the cost of 7 pencils? 9 pencils? 11 pencils?

15. If Walter has picked 6 quarts of raspberries in 2 hours, how many quarts has he picked in 1 hour? How many can he pick in 3 hours? In 4 hours?

16. If 1 orange costs 2 cents, how many oranges may be bought for 8 cents? For 18 cents? For 22 cents?

17. Make up, and solve, an example about buying stamps at 2 ¢ each.

18. If Caroline found 18 eggs and, for finding them, received $\frac{1}{3}$ of these eggs, how many did she receive?

19. If she sold her eggs for 2 ¢ each, how much money did she receive?

20. Add the following, first up and then down:

21	11	32	21	21 ¢	$ 32	12 apples
32	21	14	43	54	50	13 apples
46	30	27	30	67	18	27 apples

21. Add:

2	3	4	9¢	$ 4	5	10	3
4	1	3	2	3	2	9	7
5	5	1	7	7	11	4	2
4	9	2	1	9	12	11	21

22. Subtract:

45	41	40	62	87	74 ¢	$ 83	$ 70
23	23	23	23	40	69 ¢	$ 29	$ 50

23. A milkman has 4 cans of milk containing 23, 18, 15, 21 qt., respectively. How can he tell how many quarts he has in all, without measuring and counting the quarts?

24. If apples are 2 cents each and oranges 3 cents each, tell some of the ways in which you can spend 15 cents for them. Which of these ways do you prefer?

§ 57. Counting by 6's; Multiplication Table for 6

1. Count by 6's up to 72. By 6's from 72 down to 6. While counting, build a rectangle out of inch squares. Then mark on squared paper a rectangle 12 spaces long and 6 wide.

2. Add:

$$\begin{array}{cccccc}
6 & 6 & 6 & 6 & 6 & 6 \\
6 & 6 & 6 & 6 & 6 & 6 \\
6 & 6 & 6 & 6 & 6 & 6 \\
\underline{6} & 6 & 6 & 6 & 6 & 6 \\
 & 6 & 6 & 6 & 6 & \underline{6} \\
 & \underline{6} & 6 & 6 & 6 & \\
 & & 6 & \underline{6} & 6 & \\
 & & 6 & & \underline{6} & \\
 & & \underline{6} & & &
\end{array}$$

3. Learn and recite the multiplication table for 6.

$1 \times 6 = 6$
$2 \times 6 = 12$
$3 \times 6 = 18$
$4 \times 6 = 24$
$5 \times 6 = 30$
$6 \times 6 = 36$
$7 \times 6 = 42$
$8 \times 6 = 48$
$9 \times 6 = 54$
$10 \times 6 = 60$
$11 \times 6 = 66$
$12 \times 6 = 72$

4. Write and learn a division table for 6.

5. How many 6's in 54? In 36? In 24? In 42?

6. If 1 barrel of flour costs $6, what will 3 barrels cost? 5 barrels? 8 barrels? 4 barrels? 9 barrels?

7. If Edith reads 6 pages in 1 day, how many days will it take her to read 36 pages at the same rate? 48 pages? 54 pages? 18 pages?

8. By driving cows to the pasture Anthony earned 6 cents a day for 8 days. Find out by addition how much he earned. Find out the same by multiplication. Which is easier?

9. Anthony spent on the different days 3 cents, 4 cents, 2 cents, 8 cents, 5 cents, 3 cents, 5 cents, 2 cents. How much did he then have left?

10. At a dinner 6 raw oysters were placed on each of 7 plates. How many oysters were used?

11. Our schoolroom has 7 rows of 5 seats each. What is the shortest way of telling the number of seats?

12. Multiply

	6	6	6	6	6	6	6	6	6
by	5	8	9	7	6	4	3	11	12

13. Divide: 6)48 6)24 6)54 6)42 6)30 6)36

Tell how many are

$\frac{1}{6}$ of 48 $\frac{1}{6}$ of 54 $\frac{2}{6}$ of 48
$\frac{1}{6}$ of 24 $\frac{1}{6}$ of 72 $\frac{1}{3}$ of 48

14. By use of squared paper, show that $6 \times 9 = 9 \times 6$.

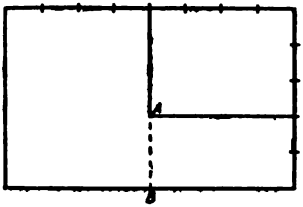
Definition

An **oblong** is a rectangle which is longer than it is wide.

15. On squared paper mark off an oblong which is 4 inches long and 2 inches wide. How many square inches does it contain?

16. Caroline's flower bed is 8 feet long and 5 feet wide. Is it a square or an oblong? How many square feet in it? Show this by drawing a plot of the flower bed.

17. In one corner of this garden roses are growing on an oblong plot 4 feet long and 3 feet wide. How many square feet are left for other flowers?



There are two ways to find this out: one by subtraction of oblongs, and the other by addition of oblongs.

18. Draw and cut from paper an oblong 3 inches long and 2 inches wide. Fold this to show halves. Fold again to show fourths. Show that $\frac{1}{4}+\frac{1}{4}=\frac{1}{2}$. Fold again and show that $\frac{1}{8}+\frac{1}{8}=\frac{1}{4}$.

19. Draw an oblong 8 spaces long and 6 spaces wide. On this show that $\frac{1}{4}+\frac{1}{4}=\frac{1}{2}$. Also that $\frac{1}{6}+\frac{1}{6}=\frac{1}{3}$.

20. In the following diagram multiply each number in the top row by each number in the bottom row in succession. Thus, to multiply 5, say 40, 10, 35, 25, 30, 20, 15, 45, 5. Treat 2, 4, 3, etc., in the same way.

		5	2	4	3	6	1	
8	2	7	5	6	4	3	9	1

§ 58. Multiplication Table for 7

Definitions

Multiplication is a short way of getting the sum of a set of equal numbers.

The **product** is the result of the multiplication.

Thus, $2 \times 7 = 14$ is an example of multiplication. In this example the product is 14.

1. On squared paper mark off a rectangle 7 spaces wide and 12 spaces long. Count by 7's up to 84. Count by 7's from 84 down to 7.

2. Learn and recite the multiplication table for 7.

$1 \times 7 = 7$
$2 \times 7 = 14$
$3 \times 7 = 21$
$4 \times 7 = 28$
$5 \times 7 = 35$
$6 \times 7 = 42$
$7 \times 7 = 49$
$8 \times 7 = 56$
$9 \times 7 = 63$
$10 \times 7 = 70$
$11 \times 7 = 77$
$12 \times 7 = 84$

3. Make and learn a division table for 7.

4. Tell how many 7's are in 42. In 21. In 63. In 56. In 28. In 84.

5. At 7 cents a quart, what will 5 quarts of blackberries cost? 6 quarts? 9 quarts? 3 quarts? 8 quarts?

6. If a trolley car travels 7 miles in one hour, how many hours will it take to go 21 miles? 35 miles? 49 miles? 14 miles? 63 miles? 42 miles?

7. John wants to save 35 cents to spend on the Fourth of July, which is 5 days off. How much must he save each day on the average?

8. Mrs. Alexander took to the store 21 cents' worth of eggs and 48 cents' worth of poultry, and bought 8 yards of muslin at 7 cents a yard. How much money did she get in exchange?

9.

Multiply	7	7	7	7	7	7	7	7	7
by	5	8	7	4	6	9	8	12	10

10. Tell how many are

$\frac{1}{7}$ of 49 $\frac{1}{7}$ of 35 $\frac{1}{7}$ of 84 $\frac{2}{7}$ of 35 $\frac{3}{7}$ of 35

11. Divide: $7\overline{)63}$ $7\overline{)35}$ $7\overline{)42}$ $7\overline{)49}$ $7\overline{)56}$ $7\overline{)77}$

12. Supply the missing number in each of the following:

$6 \times 7 = ?$ $4 \times 8 = ?$ $48 \div 6 = ?$ $54 \div 6 = ?$
$7 \times 9 = ?$ $7 \times 5 = ?$ $45 \div 9 = ?$ $36 \div 6 = ?$
$5 \times 5 = ?$ $6 \times 6 = ?$ $40 \div 5 = ?$ $56 \div 7 = ?$

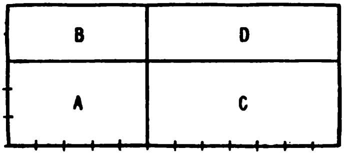
13. How many hours are there in a day? If you sleep $\frac{1}{3}$ of each day, how many hours do you sleep in a week?

14. A man wishes to plant 63 trees in 7 equal rows. How many trees will there be in each row? Draw a diagram showing this.

15. Since November contains 30 days, how many weeks does it contain and how many days left over?

16. Make up, and solve, an example similar to Ex. 15 concerning some other month.

17. Mr. Sampson has an orchard 12 rods long and 5 rods wide. Draw a diagram of the orchard and divide it into parts *A*, *B*, *C*, *D*, as is done to the right. In each square rod is one fruit tree. In the part *A* are plum trees, in *B* pear trees, in *C* peach trees, in *D* cherry trees. How many trees of each kind has Mr. Sampson? How long is the fence around his field?



18. Draw another diagram of an orchard of this size, and divide it into parts according to the way you would choose to have fruit trees planted in it.

19. Subtract:

27	41	50	62¢	75	82 apples	70	67
13	13	13	25¢	54	23 apples	60	60

20. Add:

21	17	14	16¢	12	13
13	13	13	12	9	11
4	11	11	9	4	10
9	8	10	21	17	9

§ 59. Area; Making Change

1. On squared paper mark off a rectangle 4 inches long and 3 inches wide. How many square inches does the rectangle contain? (What other name may we give this rectangle? What is a square? A square inch?)

Definition

The **area** of a rectangle is the number of square inches (or square units of any kind) which the rectangle contains.

2. Which is easier to say: "number of square inches," or "area"?

3. Construct a rectangle 5 inches by 4 inches; also one 6 inches by 5 inches. Find the area of each.

We may find the area of a rectangle by the following rule:

The area of a rectangle = (number of rows) × (number of square units in one row).

Thus, in the first rectangle of Ex. 3, area = 5 × 4 square inches = 20 square inches.

Another rule for finding the area of a rectangle is this:

Rule

The area of a rectangle = (1 square unit) × (number of units in length of rectangle) × (number of like units in its width).

Thus, in the first rectangle of Ex. 3,
area = 1 square inch × 5 × 4 = 20 square inches.

To the Teacher. See Note 28 on Area (p. 359).

4. Which is shorter: to count one by one the number of squares in the first rectangle of Ex. 3, or to say "1 square inch multiplied by 5 times 4 is 20 square inches"?

5. Construct a rectangle which contains 15 square inches.

6. Construct a rectangle whose area is 24 square inches. Do this in another way.

7. How many square feet are there in the area of a garden plot 8 feet long and 3 feet wide?

8. Find the area of a rectangle 1 ft. long and 3 in. wide.

9. If you go to the store and buy something, as 16¢ worth of sugar, and hand the storekeeper a quarter of a dollar, he will probably make change thus: "16¢ and 4¢ are 20¢ (he hands you 4¢); 20¢ and 5¢ are 25¢" (he hands you 5¢).

10. Show how the change would be counted out if you should buy 18¢ worth of muslin and pay 25¢.

11. Make change for the following:

AMOUNT OF PURCHASE	SUM PAID
(*1*) 16¢	25¢
(*2*) 11¢	two dimes
(*3*) 32¢	a half-dollar
(*4*) 27¢	a quarter and a dime

To the Teacher. See Note 34 on Making Change (p. 361).

§ 60. Multiplication Table for 8; Division

1. On squared paper mark off a rectangle 8 spaces wide and 12 spaces long. Count by 8's up to 96. Also from 96 down to 8.

2. Learn and repeat the following multiplication table for 8.

$1 \times 8 = 8$
$2 \times 8 = 16$
$3 \times 8 = 24$
$4 \times 8 = 32$
$5 \times 8 = 40$
$6 \times 8 = 48$
$7 \times 8 = 56$
$8 \times 8 = 64$
$9 \times 8 = 72$
$10 \times 8 = 80$
$11 \times 8 = 88$
$12 \times 8 = 96$

3. Work out and learn the division table for 8.

4. Tell how many 8's there are in 64. In 72. In 32 In 24. In 40.

Definitions

Division is a short way of finding how many times one number is contained in another.

The **quotient** is the result of the division.

Thus, $18 \div 2 = 9$, or $\begin{array}{r} 2\underline{)18} \\ 9 \end{array}$, is an example of division. In this example the quotient is 9.

5. What is $\frac{1}{8}$ of 16? Of 32? Of 56? Of 64? Of 80?

6. There are 8 quarts in 1 peck. How many quarts in 2 pecks? In 3 pecks? 4 pecks? 9 pecks? 8 pecks? 7 pecks? 6 pecks? 5 pecks?

7. Tell how many pecks 32 quarts will make. 40 quarts. 24 quarts. 56 quarts. 16 quarts.

8. If an electric car goes 8 miles in 1 hour, how far will it go in 5 hours?

9. If I walk 5 hours at the rate of 4 miles an hour, and then ride 3 hours at 8 miles an hour, how far do I go all together?

10. If cherries are 8 cents a quart, how many quarts can I buy for half a dollar? What change will I get?

11. I hired a horse and carriage from 10 A.M. to 6 P.M., at the rate of 50 cents an hour. How much did I have to pay?

12. A schoolhouse has 2 floors, and each floor has 4 rooms. If each room has 4 windows, how many windows does the whole schoolhouse contain?

13. By the aid of squared paper, draw a picture of the top of a telegraph pole with 9 crossbars. If each of these crossbars supports 8 wires, what is the shortest way of finding the whole number of wires supported by the telegraph pole?

14. One schoolroom has 7 rows of desks with 6 desks in a row; another room has 8 rows with 5 desks in a row. Which room accommodates the more pupils? By the aid of squared paper, draw a diagram of each of these rooms, showing the desks and also the teacher's desk.

15. From your squared paper cut out a rectangle 9 spaces long and 4 wide. Use this to represent a piece of pasteboard on which buttons are sewed as you buy them at the store. Draw a small circle in each square to represent a button. What is the short way of finding the number of buttons?

Twelve units make a dozen. How many dozen buttons are represented on your drawing?

16. Make up, and work, an example similar to Ex. 15.

17. On squared paper mark out a rectangle 8 spaces long and 4 wide. If each space of length stands for 1 foot, the whole length of the oblong stands for how many feet? Its width for how many? How many square feet does the oblong represent?

18. Mary has a flower plot 8 ft. long and 4 ft. wide, divided into 8 equal parts, in which she raises different kinds of flowers. Make a drawing of this plot which Mary might send in a letter to a friend. Insert in the 8 parts of the plot the names of different flowers.

19. Give the product of each number in the upper row by each number in the lower row:

		3	8	6	1	7	5	4	2		
3	9	12	4	11	7	10	6	9	8	5	2

§ 61. Multiplication Table for 9

1. On squared paper mark off a rectangle 9 spaces wide and 12 spaces long. Count by 9's up to 108. Also by 9's from 108 down to 9.

2. Learn and repeat the multiplication table for 9.

1 × 9 = 9	7 × 9 = 63
2 × 9 = 18	8 × 9 = 72
3 × 9 = 27	9 × 9 = 81
4 × 9 = 36	10 × 9 = 90
5 × 9 = 45	11 × 9 = 99
6 × 9 = 54	12 × 9 = 108

3. Work out and learn a division table for 9.

4. How many 9's in 45? In 63? In 18? In 81? In 36? In 72? In 90? In 108?

5. What is $\frac{1}{9}$ of 54? Of 27? Of 72? Of 90? Of 99?

6. If Elizabeth reads 9 pages in 1 day, how many pages will she read in 2 days? In 5 days? In 9 days? In 4 days? In 7 days?

7. At the same rate, how many days will she take to read a book containing 36 pages? 45 pages? 72 pages? 54 pages? 81 pages?

8. Mr. Alexander has an orchard of 8 rows of peach trees, with 9 trees in each row. What is the shortest way for him to find out how many trees he has? Draw a picture of his orchard, using a dot to represent each tree.

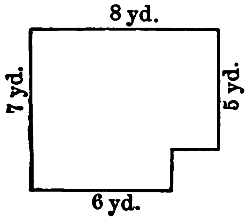
9. Martha's mother gives her a half-dollar and a nickel, and sends her to the store to buy 6 yards of calico at 9 cents a yard. How much change should Martha bring back?

10. Oscar traveled 7 hours in his motor boat at an average speed of 9 miles an hour. How far did he go?

11. At the park 6 different teams are playing baseball. How many boys are playing baseball?

12. If calico costs 9 cents a yard, how many yards can be bought for 27 cents? For 63 cents? For 81 cents?

13. How many yards, at the same price, can be bought for a dollar, and how many cents will be left over?



14. This is a diagram of the cellar floor of a house. Find the number of square yards in it. Do this, if you can, in two ways: (1) by adding oblongs; (2) by subtracting oblongs.

15. Practice weighing with the pound, ½ pound, ¼ pound, and ounce weights.

§ 62. Dry Measure; Review

1. How many quarts in a peck?

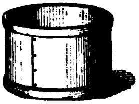
Measures

8 quarts = 1 peck.

2. How many quarts in ½ of a peck? In ¼ of a peck?

3. If a peck of cherries costs 40 cents, what will half a peck cost? What will ¼ of a peck cost?

BUSHEL


PECK

QUART

4. Which is easier to use: the quart measure 8 times, or the peck measure once? Try it and see. In which method of measuring are you more likely to make a mistake? Why?

5. How many pecks in a bushel?

Measures

4 pecks = 1 bushel.

6. If a bushel of potatoes costs 40¢, what will a peck of potatoes cost?

7. Which is easier to use: the peck measure 4 times, or the bushel measure once?

8. How many quarts in a bushel? In one half of a bushel? In three pecks?

9. Which is easier to use: the quart measure 32 times, or the bushel measure once?

10. Name some articles that are bought by the peck. Also some that are bought by the bushel.

11. Using 2 pt. = 1 qt., *pk.* for *peck*, and *bu.* for *bushel*, write the table of dry measure in a short way.

12. Recite the multiplication table for 2. For 3. For 4.

13. Recite also the division table for each of these numbers.

14. Multiply	3	2	4	2	4	3
by	6	7	5	8	9	7

15. Divide:

2)12 3)12 2)18 4)16 4)24 3)18

16. Find the area in square inches of a rectangle $\frac{1}{2}$ ft. long and 4 in. wide.

17. What is the area in square inches of a rectangle $\frac{2}{3}$ ft. long and 4 in. wide?

18. Fix in mind the products already learned by playing some number game, or with slip cards.

§ 63. Multiplication Tables for 10 and 11.

1. On squared paper mark off a rectangle 10 spaces wide and 12 spaces long. Count by 10's up to 120. Also from 120 down to 10.

2. Learn the multiplication table for 10.

1 × 10 = 10
2 × 10 = 20
3 × 10 = 30
4 × 10 = 40
5 × 10 = 50
6 × 10 = 60
7 × 10 × 70
8 × 10 = 80
9 × 10 = 90
10 × 10 = 100
11 × 10 = 110
12 × 10 = 120

3. At $ 9 each, what will 10 coats cost?

4. At $ 10 each, what will 9 coats cost?

5. If a street car conductor gets a dollar changed into dimes, how many dimes does he receive?

6. If he gets another dollar changed into nickels, how many nickels does he receive?

7. If 3 oranges cost 10 cents, what will 6 oranges cost? 9 oranges? 12? 18? 21? 24?

8. If 7 apples may be bought for 10¢, what will 14 apples cost? 21 apples? At the same price, how many apples may be bought for 40 cents? For 50 cents?

9. Which is greater: 9 × 6, or 5 × 10?

10. What is the difference between 8 × 9 and 4 × 5? Between 9 × 6 and 4 × 3?

11. Repeat all the multiplication tables learned thus far.

12. On squared paper mark off a rectangle 11 spaces wide and 12 spaces long. Count by 11's from 11 to 132. Also from 132 down to 11.

13. Write out and learn the multiplication table for 11.

14. Tell how many 11's there are in 33. In 44. In 99. In 88. In 132.

15. If 1 yard of muslin costs 11 cents, what will 5 yards cost? 6 yards? 7 yards? 4 yards?

16. Write out and learn the division table for 11.

17. At 11 cents each, how many note-books can you buy for 33 cents? For 55 cents? For 70 cents, and how many cents left over?

18. Which would you rather have: 11 nickels, or 5 dimes?

19. What is $\frac{1}{11}$ of 55? Of 77? Of 99? Of 88? Of 121?

20. Work again the examples in § 48 (p. 119).

§ 64. Multiplication Table for 12; Telling Time

1. On squared paper mark off a rectangle 12 spaces long and 12 spaces wide. Count by 12's from 12 to 144. Also from 144 down to 12.

2. Write out and learn the multiplication table for 12.

3. Multiply:

$$\begin{array}{ccccccc} 6 \times 12 & 7 \times 12 & 12 & 12 & 12 & 12 & 12 \\ & & \underline{5} & \underline{4} & \underline{9} & \underline{8} & \underline{12} \end{array}$$

4. Tell how many 12's in 84. In 72. In 60. In 96. In 132. In 144.

What is $\frac{1}{12}$ of 48? Of 36? Of 60? Of 24? Of 144?

5. If an automobile travels 12 miles in 1 hour, how far will it travel in 5 hours? In 7 hours? In 9 hours? In 11 hours?

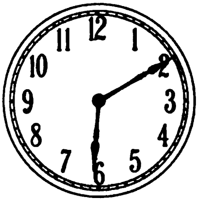
6. Make up, and solve, an example concerning buying a certain number of yards of muslin at 12 cents a yard.

7. If one melon costs 12 cents, how many melons may be bought for 36 cents? For 60 cents? For 75 cents, and how many cents left over?

8. How many eggs in 5 dozen? In 6 dozen? In 9 dozen? In 7 dozen?

9. How many dozen in 36? In 24? In 72? In 84?

10. Give all the number facts you can concerning 24. 36. 32.



11. What is the time of day with the hands of the clock as they are in the picture?

12. If the hour hand were a little past 12, and the minute hand pointed at 3, what would be the time of day? What would be the time of day if the hour hand were between 2 and 3 and the minute hand pointed at 4?

13. Draw a picture of a clock face, and place the hands to show quarter past one. To show 25 minutes past two.

14. Draw a picture of a clock face, using the Roman number signs I, II, III, etc., instead of 1, 2, 3, etc.

15. On this drawing show how the hands must be placed to show half-past one. To show the time at which school opens. To show the time at which school closes. To show the time at which recess begins.

16. A street car runs every 15 minutes, beginning on the hour. Make out a schedule for one hour.

17. Another street car runs every 10 minutes, beginning 5 minutes past the hour. Make out a schedule for one hour.

§ 65. Multiplication and Addition combined; Inexact Division; Ounce and Pound

1. Find the sum of each of the following in the shortest way:

(1)	(2)	(3)	(4)	(5)
6	8	5	5	6
6	8	9	2	6
6	8	9	8	6
3	5	9	8	6
	8	9	8	3
			8	5

2. Mary bought 5 yards of muslin at 9 cents a yard, and spent 6 cents for a spool of thread. How much did she spend in all?

9¢ = price of 1 yard of muslin.
5 = number of yards.
45¢ = cost of 5 yards of muslin.
6¢ = cost of 1 spool of thread.
51¢ = entire amount spent.

To the Teacher. See Note 24 concerning Oral and Written Statements (p. 357).

3. Find the value of 9 fours and 3. Also of $9 \times 4 + 3$. Of 9×4¢ $+ 3$¢.

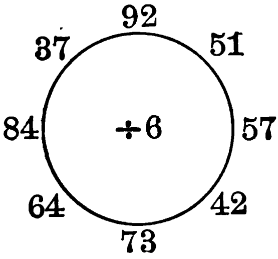
4. Caroline bought 6 pounds of sugar at 5 cents a pound, and a nutmeg for 3¢. How much did she spend in all?

5. Harry bought 6 post cards at 2¢ each, and also paid 5 cents for a bottle of ink. How much did he spend?

6. At sight, divide and state the quotient and remainder for each of the following:

(*1*) $12 \div 5$
(*2*) $20 \div 3$
(*3*) $17 \div 4$
(*4*) $25 \div 6$
(*5*) $35 \div 9$
(*6*) $36 \div 8$
(*7*) $40 \div 6$
(*8*) $41 \div 5$
(*9*) $42 \div 9$
(*10*) $79 \div 9$

7. Divide each number outside the ring by 6. Then change 6 to 7, 8, 9 in succession.



8. How many pounds of meal can be bought for 25 cents, at 4¢ a pound, and how many cents are left over? How many pounds of sugar at 6¢ a pound? Of prunes at 9¢ a pound?

9. Answer the questions of Ex. 8, using 50 cents in place of 25 cents.

10. Mary bought 6 Christmas toys, at 7¢ each, and had 8 cents left over. How much money had she at first?

11. Write the following in a shorter way:

16 ounces = 1 pound.

12. Name some articles bought by the pound. Also some bought by the ounce.

13. How many ounces in $\frac{1}{2}$ of a pound? In $\frac{1}{4}$ of a pound? In 2 lb.?

14. 8 oz. is what part of a pound? 4 oz. is what part of a pound?

15. If tea costs 40 cents a pound, what does $\frac{1}{2}$ of a pound cost? $\frac{1}{4}$ of a pound?

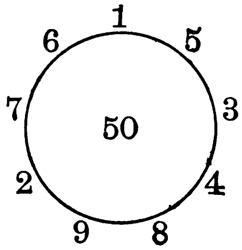
16. If $\frac{1}{4}$ lb. of candy costs 15¢, what does 1 lb. cost? 3 lb.?

17. Estimate the weight of various objects, as books, boxes of crayon, paper bags partly filled with sand, and correct your estimate by actually weighing each object.

§ 66. Review

1. Review previous countings.

2. Practice the rapid addition and subtraction of numbers by aid of the ring in the following ways:



Begin with the figure 1 outside of the ring, and add to the right (stating sums only) till the sum exceeds 50.

Begin with any number, and add to the right or left till the sum exceeds any given number up to 100.

Take any number, as 50, and subtract numbers about the ring in succession (stating each successive result) till the remainder is the smallest possible.

3. Review the multiplication and division tables by "choosing sides."

4. Add:

$$\begin{array}{r}32\text{¢}\\27\\21\\\underline{10}\end{array}\quad\begin{array}{r}12\\18\\29\\\underline{11}\end{array}\quad\begin{array}{r}\$39\\40\\12\\\underline{17}\end{array}\quad\begin{array}{r}3\\2\\7\\1\\\underline{6}\end{array}\quad\begin{array}{r}4\\2\\1\\9\\\underline{3}\end{array}\quad\begin{array}{r}8\\12\\7\\6\\\underline{5}\end{array}\quad\begin{array}{r}12\\10\\9\\8\\\underline{7}\end{array}\quad\begin{array}{r}36\\1\\5\\11\\\underline{9}\end{array}$$

5. Subtract:

$$\begin{array}{r}36\text{¢}\\\underline{12\text{¢}}\end{array}\quad\begin{array}{r}40\text{¢}\\\underline{12\text{¢}}\end{array}\quad\begin{array}{r}81\text{¢}\\\underline{22\text{¢}}\end{array}\quad\begin{array}{r}26\\\underline{12}\end{array}\quad\begin{array}{r}80\\\underline{25}\end{array}\quad\begin{array}{r}70\\\underline{20}\end{array}\quad\begin{array}{r}65\\\underline{30}\end{array}\quad\begin{array}{r}81\\\underline{29}\end{array}$$

6. Subtract the sum of $19+12+10$
from the sum of $20+12+32$

7. Give all the number facts you can concerning 36, 48, 54, 27, 35, 12, 13, 14, 15, 16.

8. On squared paper show that $9 \times 6 = 6 \times 9$.

9. Make up, and work, an example similar to Ex. 8.

10. Multiply:

$$\begin{array}{r}8\\\underline{5}\end{array}\quad\begin{array}{r}5\\\underline{4}\end{array}\quad\begin{array}{r}11\\\underline{5}\end{array}\quad\begin{array}{r}9\\\underline{8}\end{array}\quad\begin{array}{r}8\\\underline{12}\end{array}\quad\begin{array}{r}6\\\underline{9}\end{array}\quad\begin{array}{r}8\\\underline{7}\end{array}\quad\begin{array}{r}5\\\underline{12}\end{array}\quad\begin{array}{r}12\\\underline{6}\end{array}$$

11. Divide:

$$3\overline{)12}\qquad 4\overline{)20}\qquad 3\overline{)18}\qquad 5\overline{)50}\qquad 12\overline{)60}\qquad 9\overline{)72}$$

12. Pick out and write together the equals:

8×3	2 gal.	6×3	6×4	8 qt.
$13 + 11$	9×2	$12 + 8$	3×8	6 qt. + 4 pt.
5 qt. + 3 qt.	$18 + 2$	$12 + 6$	10×2	7 qt. + 2 pt.

13. About how much shorter is 75 to write than "seven tens and five ones"?

14. Draw a number picture to show 27, as on page 117. Use squared paper as a help.

15. Make the largest number you can with the figures 3 and 6. What other number can you make with these figures?

16. Write in the shortest way: seven pecks and five bushels; two thirds; $\frac{1}{6}+\frac{1}{6}$; 7 tens and 3 units; 27 + 31; 3 quarts + 6 pints.

17. If 1 pound of tea costs 60 ¢, what will $\frac{1}{2}$ lb. cost? $\frac{1}{4}$ lb.? $\frac{3}{4}$ lb.?

18. Tell, by counting by 2's, how many gloves 8 girls will wear. What is a shorter way of finding this?

19. By counting by 4's, tell how many shoes 4 horses have. In what shorter way can you find this out?

20. Mr. James had 56 chickens and sold 21. How can he find out how many he has left, without counting them?

21. A storekeeper had a barrel of vinegar containing 32 gallons. From it he has sold 15 gallons. How can he tell how many gallons he has left?

22. Make up a story about a heap of potatoes containing —— bushels, from which —— bushels were sold, to show how subtracting saves labor.

23. Make up a problem entirely your own to show how subtracting saves labor.

24. 9 pt. + 3 pt. = ? qt. How many gallons?

25. Find the number of days in the spring months. (Is there any shorter way of doing this than counting them?) Also find the number of days in the autumn months. Now find the difference.

26. If school is in session from 9 A.M. to 1 P.M., how many hours is this?

27. If we spend half the time from 6 A.M. to 6 P.M. in school, how many hours do we spend in school?

28. Can all multiplication examples be done by addition? Show how to find 8×9 by addition.

29. $1\frac{1}{2}$ lb. = ? oz. What part of a pound is 4 oz.?

30. In four successive weeks, by hemming handkerchiefs Mary earned 24¢, 32¢, 21¢, and 28¢. How much did she earn in all?

31. My bookcase holds, on different shelves, 21, 18, 32, 19 books. How can I tell how many books it contains, without counting them?

32. On squared paper mark off an oblong 12 spaces by 4 spaces. On it show that $\frac{1}{6}+\frac{1}{6}=\frac{1}{3}$. Also $\frac{1}{4}+\frac{1}{4}=\frac{1}{2}$.

33. On the same oblong show that $\frac{3}{4}-\frac{1}{4}=\frac{1}{2}$. $\frac{5}{6}-\frac{1}{6}=$?

34. What is "area"? What is the short rule by which to get the area of a rectangle whose length and width are known?

35. Measure the length of the schoolroom in yards. Also its width. On squared paper make a diagram of the schoolroom floor, using 1 space on the paper for 1 yard. Tell, as nearly as you can, the area of the floor in square yards.

36. Measure in yards the length and width of your room at home. On squared paper make a diagram of the floor, using 1 space for 1 yard. Tell, as nearly as you can, the area of the floor in square yards. Will what you have done save labor in buying carpet to cover the floor? How?

Let the pupil take home a piece of string 1 yard long for measuring, if he has no yardstick at home.

37. If 4 oranges cost 12 cents, what does 1 orange cost? 5 oranges? $\frac{1}{2}$ dozen oranges? 9 oranges?

38. If 4 quarts of milk cost 20 cents, what does 1 quart cost? 2 quarts? 1 gallon? $1\frac{1}{2}$ gal.?

39. Ralph paid 11¢ for paper and 2¢ for a pen. Make change for the two dimes which he handed the storekeeper.

40. Henry spelled 9 words correctly to-day, 8 words yesterday, 7 words the day before, and 9 words the day before that. How many words has he spelled correctly on these days? On these days he missed 5, 3, 2, 3 words. How many more words did he have right than wrong?

41. Multiply each number in the row above by each number in the row below:

9	4	6	10	5	7	11	8	12	1	3	2
7	1	8	2	9	3	10	4	11	5	12	6

42. Fix these products in mind by playing some number game.

§ 67. Review: Raising Poultry

1. This is a picture of Anna's chicken yard. If Anna had 43 chickens and sold 17 of them, how many chickens did she have left?

2. If one hen hatched 12 chickens, another hen hatched 13, and another 8, how many chickens were hatched in all?

3. If Anna's chickens ate 3 quarts of corn in one day, how many quarts would they eat in a week? How many pecks is this, and how many quarts over?

4. How many quarts in 3 pecks of feed? In 5 pecks? In 2 pecks and 3 quarts?

5. If Anna got 46 eggs in one week, and 57 eggs the next week, how many eggs did she get in the two weeks?

6. If eggs sell for 36¢ a dozen, what is 1 egg worth? 5 eggs? 8 eggs? 7 eggs?

7. In one year Anna spent $ 37 for chicken feed, and received $ 73 for the chickens and eggs that she sold. How much did she make?

8. If she spent for books $\frac{1}{4}$ of what she made, how much did she spend in this way?

9. If she put $\frac{1}{3}$ of what she made into the savings bank, how much did she put there?

10. How much did she have left to use in other ways?

11. Anna's chicken yard is 12 yards long and 7 yards wide. Draw a diagram of the yard on squared paper.

12. The chicken house is 4 yards long and 3 yards wide. Draw a diagram of this also.

13. Walter keeps pigeons and sold 27 squabs in March, 31 in April, and 28 in May. How many did he sell in all?

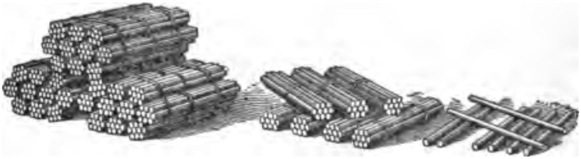
14. Make three other examples concerning the pigeons kept by Walter, and work these examples.

15. Make, and work, examples concerning a boy, or a girl, who raised ducks.

CHAPTER IV

NUMBERS THROUGH THOUSANDS; MULTIPLICATION AND DIVISION BY NUMBERS CONTAINING ONE FIGURE

§ 68. Writing and Reading Numbers through Thousands



1. If 10 packets of 10 splints each are tied together, they make a packet of 100 splints.

> *Definition*
>
> One **hundred** is ten **tens.**

2. In the picture how many hundreds are there?

> *Principle*
>
> In any number of three figures, the **right-hand** figure stands for **units**, the **middle** figure for **tens**, and the **left-hand** figure for **hundreds**.

3. In 378 how many hundreds? How many tens? How many units?

4. How many hundreds, tens, and units in each of the following: 256, 407, 923, 870, 800?

5. Show the meaning of 256 by the use of splints.

6. Which is easiest to write: 3 hundreds + 7 tens + 8 units, or 3 h. 7 t. 8 u., or 378?

7. Read the following: 276, 523, 980, 300, 760, 104, 815, 805, 909.

Also write each in the following way: 276 means 2 hundreds, 7 tens, 6 units.

Notice that the word *and* is not used in reading a number.

8. Write the following in figures:

(*1*) Two hundred sixty-three.
(*2*) Three hundred seventy-one.
(*3*) Nine hundred six.
(*4*) Seven hundred fourteen.
(*5*) Eight hundred sixty.
(*6*) Four hundred thirteen.
(*7*) Five hundred seven.
(*8*) Nine hundred eleven.

9. Make all the 3-figured numbers you can with the figures 5, 2, and 8. Which of these numbers is the largest? Why?

10. What is the largest possible 3-figured number? What is the smallest possible 3-figured number?

11. What number is greater than each of the following by 100?

(*1*) 243 (*2*) 357 (*3*) 650 (*4*) 500 (*5*) 608

What number is less by 100? Also name those greater by 200; and those less by 200.

12. What number is 10 greater than each number in Ex. 11? Also 10 less? 20 greater? 20 less?

13. In the town (or county) where you live, are there more than one hundred people? Are there more than 10 hundreds?

Definition

One **thousand** is ten hundreds.

14. Have you enough splints to make 10 bundles, each of which contains 10 tens (or 100)?

Principle

In writing numbers, a figure which stands for **thousands** is put in the **fourth** place to the **left.**

A comma is often put between the hundreds and thousands figures to aid in reading a number.

15. In 3,567 how many thousands are there? What do the other figures stand for?

16. Which is easiest to write: 3 thousands + 5 hundreds + 6 tens + 7 units, or 3 th. + 5 h. + 6 t. + 7 u., or 3567?

17. Read:

(1) 2357
(2) 5715
(3) 4716
(4) 9308
(5) 7096
(6) 8370
(7) 5028
(8) 9009
(9) 7017
(10) 3705
(11) 5670
(12) 9038
(13) 6975
(14) 4035
(15) 8111
(16) 1011

18. Read the following:

(1) The area of Rhode Island is 1250 square miles.
(2) The area of New Jersey is 7815 square miles.
(3) The Pilgrims landed at Plymouth in the year 1620.

In reading dates, thousands and hundreds are read together as hundreds. Thus, "year 1620" is read, "year sixteen hundred twenty."

(4) George Washington was inaugurated as our first President in the year 1789.

19. Write with figures:

(1) Eight thousand five hundred seventy-four.
(2) Seven thousand six hundred forty-six.
(3) Three thousand four hundred seven.
(4) One thousand two hundred seventeen.
(5) Six thousand seven hundred eight.
(6) Two thousand fifty-nine.
(7) Nine thousand eleven.
(8) Five thousand two.

20. Write the following in a shorter way:

(1) Sound travels one thousand ninety feet per second.

(2) One mile contains one thousand seven hundred sixty yards.

(3) One mile contains five thousand two hundred eighty feet.

21. 999 + 2 = how many figures?

22. Make the largest number you can with the figures 3, 7, 2, 9.

23. Make the largest number you can containing four figures.

24. If in paying a debt of $2373 you should use only thousand, hundred, ten, and one-dollar bills, how many of each kind would you use?

§ 69. Roman Notation to One Hundred

1. In the Roman notation, what does X stand for? V? I?

2. The Romans also let L = 50 and C = 100. Hence we have the following letters used in the Roman notation:

I = 1   V = 5   X = 10   L = 50   C = 100

3. Write the numbers from 1 to 12 in Roman signs.

4. By an examination of the signs used in Ex. 3, we see that in the Roman notation

Principles

When a letter is **repeated**, its value is repeated.

When a letter is placed **after** another letter of greater value, the **sum** of the letters is expressed.

When a letter is placed **before** another letter of greater value, their **difference** is expressed.

Thus, II means $1+1$ or 2. XX means $10+10$ or 20. XXX $= 30$, etc.

VI $= 5+1$ or 6. XII $= 10+1+1 = 12$. LX $= 50+10 = 60$.

IV $= 5-1 = 4$. IX $= 10-1 = 9$. XL $= 50-10 = 40$.

5. Hence:

I = 1
II = 2
III = 3
IV = 4
V = 5
VI = 6
VII = 7
VIII = 8
IX = 9
X = 10
XI = 11
XII = 12
XIII = 13
XIV = 14
XV = 15
XVI = 16
XVII = 17
XVIII = 18
XIX = 19
XX = 20

6. Tell the value of XX. Of XXI. Of XXV. Of XXVI. Of XXIV. Of XXX.

7. Express the following numbers in the Roman notation:

13 23 25 30 31 40 52 60 70 73 75 76 80

8. We have now learned that numbers can be written in three distinct ways. Write each of the following in the other two ways: forty, 38, ninety-one, 43, XIV, IX, 89, XCVI, sixty-six, 48.

9. Tell which is easier to add: $\begin{array}{c}\text{IV}\\ \underline{\text{XI}}\end{array}$ or $\begin{array}{r}4\\ \underline{11}\end{array}$

10. Write in the Roman notation the numbers of the first twenty sections in this book, thus: Section I, Section II, etc. Then write the numbers as they are expressed in the book. Which set is easier to write? Which is easier to read?

11. Why, then, do we ever use the Roman notation?

§ 70. Addition through Hundreds and Thousands; Perimeter

1. Add 16 and 27 by use of splints. By use of splints, add 274 and 153.

2. Add 674 and 568.

The teacher may go through this work as in Ex. 1, § 53 (p. 131).

Let the teacher give the following explanation orally. Then let the pupil repeat it (with change of pronoun). This applies to explanations in general.

WRITTEN WORK

$$\begin{array}{rl} \left.\begin{array}{r} 674 \\ 568 \end{array}\right\} & \textit{Addends} \\ \hline 1242 & \textit{Sum} \end{array}$$

EXPLANATION

(*a*) 8 ones + 4 ones = 12 ones = 1 ten + 2 ones. Set down the 2 ones only. Add the 1 ten with the other tens, thus:

(*b*) 1 ten + 6 tens = 7 tens. 7 tens + 7 tens = 14 tens = 1 hundred + 4 tens. Set down the 4 tens and add the 1 hundred to the other hundreds, thus :

(*c*) 1 hundred + 5 hundreds + 6 hundreds = 12 hundreds = 1 thousand + 2 hundreds, both of which we set down.

3. Add 346, 545, 317, 215.

WRITTEN WORK

$$\begin{array}{rl} 346 & \\ 545 & \\ 317 & \\ 215 & \\ \hline 1423 & \textit{Sum} \end{array}$$

EXPLANATION

In practice we begin at the bottom of the units' column and give only sums. We say, "5, 12, 17, 23," and set down 3.

Then for tens' column, say "2, 3, 4, 8, 12," and set down 2.

For hundreds' column, say "1, 3, 6, 11, 14," and set down 4 under hundreds' column and 1 in thousands' place.

Let the pupil test the accuracy of the work by adding the columns downward.

4. Add each of the following. Test your work in all cases, by adding columns down after adding them up.

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)	(*6*)
276	428	$270	512 ft.	892 men	5672
309	926	512	806 ft.	74 men	3891
512	72	486	427 ft.	508 men	723

(*7*)	(*8*)	(*9*)	(*10*)	(*11*)	(*12*)
736	923	615	300	842	312
408	427	192	706	786	999
519	61	872	419	599	888

5. Add:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)	(*6*)
263	$864	512 ft.	926	739	7123
425	741	762 ft.	37	806	6147
846	375	400 ft.	106	429	3192
407	284	87 ft.	478	317	4723

6. A touring automobile in three successive days ran 101, 112, and 96 miles. How far did it go in all the three days?

To the Teacher. See Note 24 concerning Oral and Written Statements (p. 357).

7. A fast ocean steamer went 623, 627, and 612 miles in three days. How far did it go in all?

8. If you should count 243 on to 327, about how many times as long do you think it would take to do this as to add 243 and 327?

9. George Washington was born in the year 1732 and lived 67 years. In what year did he die?

10. If a man owns a farm of 243 acres, another of 115 acres, and a third of 321 acres, how many acres has he all together?

11. A man has deposited in three banks the following amounts: $3521, $1062, and $5215. How much has he in all the banks?

12. A carriage cost $223, a horse $315, and a set of harness $60. What was the total cost of all three?

13. Find the sum of three hundred forty-six, two hundred eleven, and four hundred thirty.

14. Find the sum of the pages in three of your textbooks.

15. From squared paper cut out a rectangle 5 inches long and 4 inches wide. How many inches long are all the sides added together?

Definition

The **perimeter** of a rectangle is the sum of its sides.

Thus, the perimeter of the rectangle in Ex. 15 is 5 in. + 4 in. + 5 in. + 4 in., or 18 in.

To the Teacher. See Note 25 concerning Definitions (p. 358).

16. Does the length of the fence around a field equal the perimeter of the field? Find the perimeter of a field whose sides are 216 ft., 312 ft., 492 ft., 376 ft.

17. Which is easier to say: "length of the sum of the sides," or "perimeter"? Which is easier to write?

18. What is the perimeter of a rectangle 35 ft. long and 15 ft. wide? Find the sum of the sides. Also add the length and the width, and multiply their sum by 2. Which is the shorter way of finding the perimeter?

19. If our garden is a rectangle 65 ft. long and 42 ft. wide, find its perimeter.

20. Work Exs. 4–14 on pages 125–126 as sight work.

21. In 6300, what does the 6 stand for? The 3? Take away the two zeros; what do the 6 and 3 stand for now?

22. In 57, what does each figure stand for? Put a zero to the right of the 7. What does each figure denote now?

23. Repeat the multiplication tables for 2, 3, 4, and 5.

§ 71. Subtraction through Hundreds and Thousands

1. By use of splints, subtract 26 from 41; 174 from 329. (See p. 134.)

2. Subtract 236 from 584.

WRITTEN WORK

$$\begin{array}{r} {\scriptstyle 7\ 14} \\ 584 \\ \underline{236} \\ 348 \end{array}\ \textit{Remainder}$$

EXPLANATION

6 units from 14 units leaves 8 units (which write).

3 tens from 7 tens leaves 4 tens (which write).

2 hundreds from 5 hundreds leaves 3 hundreds (which write).

The pupil should soon learn to dispense with figures like the small 7 and 14 at the top in the above written work.

To test the correctness of our work, we add the remainder to the number subtracted (called the *subtrahend*), thus:

$$\begin{array}{r} 348 \\ \underline{236} \\ 584 \end{array}$$

If the sum obtained equals the number subtracted from (called the *minuend*), the work is probably correct.

3. Subtract each of the following. Test your work in each example by adding the remainder to the subtrahend to obtain the minuend.

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
429	468	531	602	561	300
274	281	340	461	328	137

(7)	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
648	726	8652	$7230	9621	4387
415	516	3440	4120	8510	1276

(13)	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*
5304	6546	7852	8462	9991	10789
1102	3214	5220	4120	8880	7635

To the Teacher. See Note 27 concerning Methods of Subtraction (p. 358).

4. Subtract 1367 from 3000.

WRITTEN WORK

$$\begin{array}{l} {}^{2\ 9\ 9\ 10} \\ 3000 \\ \underline{1367} \\ 1633\ \textit{Remainder} \end{array}$$

EXPLANATION

7 units from 10 units leaves **3** units (which write).

6 tens from 9 tens leaves **3** tens (which write).

3 hundreds from 9 hundreds leaves **6** hundreds (which write).

1 thousand from 2 thousands leaves **1** thousand (which write).

5. Subtract and test your work in each example:

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
842	6704	8042	$ 9147	4000	8074 ft.
695	3508	5439	$ 8638	1276	4869 ft.

(7)	*(8)*	*(9)*	*(10)*	*(11)*
5423 pounds	6841	7350	84065	9000
4456 pounds	3062	5631	30428	7624

6. Subtract and test:

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
6948	4315 ft.	5346	9657 yd.	5000	6100
2416	3212 ft.	3106	5021 yd.	2716	3874

7. What is the difference between 3275 and 2132?

8. From a farm containing 672 acres, the owner sold 412 acres. How many acres were left?

9. About how many times as long do you think it would take to count 412 off from 672, as to subtract 412 from 672?

10. There are 400 pupils in a certain school. 217 are boys. How many are girls? Which is easier: to count the girls, or to subtract 217 from 400?

11. My book contains 406 pages and I have read 238 pages. How many pages have I yet to read?

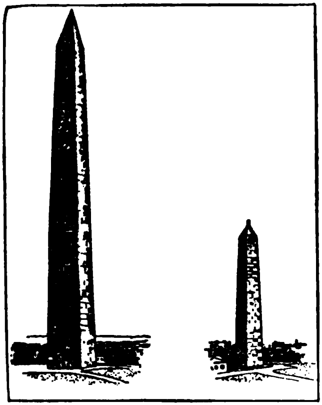
12. I sold a house for $4900 at a gain of $ 450. What did the house cost me?

13. George Washington was born in 1732 and died in 1799. How old was he when he died?

14. Abraham Lincoln died in 1865 at the age of 56. In what year was he born?

15. Columbus discovered America in 1492. How many years ago was that?

16. If the Washington monument is 555 ft. high and the Bunker Hill monument is 221 ft. high, how much higher is the former? Find the sum of their heights.



17. Martin was flying a kite on a string 300 ft. long. The string broke and he lost his kite. He found by measuring that he had 189 ft. of string left. How many feet did he lose?

18. What number must be added to 215 to make 596?

19. We have 315 books in one bookcase and 412 in another. How many books have we in all? How many shall we need to buy in order to have 1000 books?

20. $\frac{1}{4}$ ft. + $\frac{1}{4}$ ft. + $\frac{1}{4}$ ft. = how many inches?

21. If each side of a square house is 9 yd. long, find the perimeter of the house in the shortest way.

22. How many examples on p. 126 can you work at sight?

23. Choose sides and have a match game in recalling the products contained in the multiplication tables.

§ 72. Making Change ; Subtraction

1. If you buy an article worth 36 cents and hand the storekeeper a half-dollar, he will give you the difference, speaking about as follows:

"36 and 4 are 40" (he pays you 4¢); "40 and 10 are 50" (he pays you 10¢). Sometimes this form of statement is shortened, for instance, as follows: "36 and 4" (he pays you 4¢) "and 10" (he pays you 10¢).

2. In like manner make change for 50¢ when the amount of a purchase is each of following:

37¢ 35¢ 27¢ 43¢ 7¢ 19¢ 42¢ 28¢ 17¢ 46¢

3. John paid a five-cent carfare for each of two friends and himself. What change would he receive for a quarter?

4. Eva bought 6 pounds of sugar at 6¢ a pound. What change would she receive for a half-dollar?

5. Jane paid 56¢ for muslin. What change would she receive for a half-dollar and a quarter?

6. Harry bought 31 cents' worth of paper and 25 cents' worth of pencils. What change did he receive for a dollar?

7. From a box draw numbers (1–24) to represent the amount of your purchase. Make change for a quarter. For a half-dollar.

8. Taking the following market report, let each pupil buy enough meat, two kinds of vegetables, and fruit for a meal, the purchase not to exceed one dollar. Then

let him pay some pupil who has been appointed to act as cashier. Let the cashier make change; if the cashier makes a mistake, he or she is to be removed and another pupil appointed as cashier. Toy money, made for the purpose out of paper or cardboard, may be used. (It may be more interesting to use market reports obtained by the teacher or pupils from the local markets.)

Market Report

Sirloin Steak . . .	22	Canned Peas . . .	12
Rump Steak . . .	18	Canned Corn . . .	10
Sausage	16	Cranberries	12
Lamb Chops	23	Oranges	30 per doz.
White Potatoes . . .	20 (1 pk.)	Apples	18 (pk.)
Sweet Potatoes . . .	30 (pk.)	Pears	10 (pk.)

To the Teacher. See Note 33 concerning Market Reports (p. 361).

9. "Making change" is really subtraction performed by the use of addition.

Thus, in subtracting 36 from 50, we may subtract by saying, "6 and 4 are 10 (set down 4); 4 and 1 are 5 (set down 1)."

$$\begin{array}{r}50\\ \underline{36}\\ 14\end{array}$$

$$\begin{array}{r}154\\ \underline{89}\end{array}$$

Again, we may subtract in the example to the left by saying, "9 and 5 are 14;
8 and 1 (or 9) and 6 are 15."

10. All examples in subtraction could be worked by this method, called the additive method of subtraction. Work Exs. 5–8 on page 179 by this method.

11. Let the pupil or the teacher put similar examples on the blackboard to be worked by this method.

§ 73. United States Money

1. How many cents are there in a dime? In a dollar?

Measures

10 cents = 1 dime.
10 dimes = 1 dollar.
100 cents = 1 dollar.

2. Which is easier to write: 5 dollars, or $ 5? 15 cents, or 15 ct., or 15¢?

Signs

In writing dollars and cents together, a period called the **decimal point** is put between the number of dollars and the number of cents, and a **dollar mark** is written before the entire number.

3. Which is easier to write: seventeen dollars and thirty-seven cents, or $ 17.37?

4. Read: $ 5.41; $ 19.62; $ 217.93; $ 8.07; $ 1729.16.

5. Write in figures:
   - (*1*) Twenty dollars and ninety cents.
   - (*2*) Eighteen dollars and eighteen cents.
   - (*3*) Seventy-six dollars and forty-one cents.
   - (*4*) Nine dollars and ten cents.
   - (*5*) Fifty cents. Sixty cents. Seven cents.
   - (*6*) Three cents. Nine cents. Ten cents.

(*7*) Seven dollars and six cents.
(*8*) Two hundred ten dollars and five cents.
(*9*) One thousand six dollars and forty-three cents.
(*10*) Seven hundred one dollars and one cent.

Add:

6.	7.	8.	9.
$957.23	$997.15	$175.44	$571.77
85.17	3.89	83.07	38.54
138.76	48.55	4.50	4.54
5.44	7.41	912.63	83.73

10. James had $27.15 in the savings bank at the beginning of the year, and during the year he put in $2.08, $10.75, and $3.12 at different times. He also received $1.23 in interest during the year. How much did he have in the bank at the end of the year?

11. If, from this money in the bank, James spent $4.15 for Christmas presents for his relatives and friends, how much would he have left?

12. Mrs. X spent $1.27 for groceries. What change would she receive from a two-dollar bill?

13. If I make purchases costing $1.23, $.76, and $2.24, what change will I receive for a five-dollar bill?

14. Do you know what a gold coin worth $10 is called? If you do not know, can you find out?

15. Time yourself and see how long it will take you to repeat the multiplication tables. Find the shortest time in which any pupil in your class can do this without a mistake.

§ 74. Multiplication by 2, 3, 4, and 5

1. Multiply:

$$\begin{array}{l}\text{6 apples}\\ 4\\ \hline\end{array}\qquad\begin{array}{l}\text{6 tens}\\ 4\\ \hline\end{array}\qquad\begin{array}{r}60\\ 4\\ \hline\end{array}\qquad\begin{array}{l}\text{7 hundreds}\\ 4\\ \hline\end{array}\qquad\begin{array}{r}700\\ 4\\ \hline\end{array}$$

$$3\times 8\text{ apples}\qquad 3\times 8\text{ tens}\qquad 3\times 8\text{ hundreds}\qquad\begin{array}{r}70\\ 5\\ \hline\end{array}\qquad\begin{array}{r}700\\ 5\\ \hline\end{array}$$

2. If one suit of clothes costs $20, what will 2 suits cost? 3 suits? 4? 5?

3. If one building lot costs $300, what will 2 lots cost? 3 lots? 4? 5?

4. Multiply 413 by 2.

We may express this work in the following different forms:

$$\begin{array}{cccc}
(1) & (2) & (3) & (4)\\
\begin{array}{r}2\times 400=800\\ 2\times 10=\ \ 20\\ 2\times 3=\ \ \ \ 6\\ \hline 826\end{array} &
\begin{array}{r}413\\ \times 2\\ \hline 6\\ 20\\ 800\\ \hline 826\end{array} &
\begin{array}{ccc}4&1&3\\ &\times&2\\ \hline &&6\\ &2&\\ 8&&\\ \hline 8&2&6\end{array} &
\begin{array}{r}413\\ \times 2\\ \hline 826\end{array}
\end{array}$$

The most convenient form is the last. Hence we have

WRITTEN WORK	EXPLANATION
413 *Multiplicand* 2 *Multiplier* 826 *Product*	We write the *multiplier* 2 under the units' figure of the number to be multiplied (called the *multiplicand*), and begin at the right to multiply.

2 times 3 units = **6** units (write 6 units).
2 times 1 ten = **2** tens (write 2 tens).
2 times 4 hundreds = **8** hundreds (write 8 hundreds).

5. Multiply 567 by 3.

WRITTEN WORK	EXPLANATION
567 3 1701 *Product*	3 times 7 units = 21 units = 2 tens + 1 unit (write 1 unit). 3 times 6 tens = 18 tens. 18 tens + 2 tens = 20 tens = 2 hundreds + 0 tens (write 0 tens).

3 times 5 hundreds = 15 hundreds.

15 hundreds + 2 hundreds = 17 hundreds = 1 thousand + 7 hundreds (write both of these).

Or we may say briefly, "3 times 7 are 21; 3 times 6 are 18, and 2 are 20; 3 times 5 are 15, and 2 are 17."

6. Multiply:

(*1*) 343 2	(*2*) 256 3	(*3*) 412 4	(*4*) 572 4	(*5*) 406 3
(*6*) 615 5	(*7*) $605 5	(*8*) $870 3	(*9*) $901 4	(*10*) $837 2

7. Multiply each of the following by 2:

(*1*) 217 (*2*) 308 (*3*) 526 (*4*) $910

(*5*) $879 (*6*) 2134 (*7*) 2076 (*8*) 4647

8. Multiply each of the numbers in Ex. 7 by 3; also by 4; also by 5.

9. Add: 728 728 728 728 728	Now multiply: 728 5

How many figures did you make in the first process? How many in the second? How much easier, then, is the second process than the first?

10. One quire of paper contains 24 sheets; how many sheets are there in 2 quires? In 5 quires? In 4 quires?

11. One barrel of flour contains 196 pounds. How many pounds will 3 barrels contain? 4 barrels? 2 barrels? 5 barrels?

12. If a box of oranges contains 225 oranges, how many oranges will 4 boxes contain? 3 boxes? 5 boxes?

13. If one carload of cranberries contains 240 barrels, how many barrels will 5 carloads contain? 3 carloads? 2?

14. What is the cost of 120 tons of coal at $5 per ton?

Proceed thus:

$$\begin{array}{r} 120 \\ \underline{(\$)\,5} \\ \$600 \end{array}$$

This must be read "120 times $5."

15. What is the cost of 108 tons of coal at $4 a ton?

16. What is the cost of 212 oranges at 2¢ each?

17. What is the cost of 256 barrels of flour at $5 a barrel?

18. If 185 bushels of potatoes are raised on 1 acre, how many bushels will 3 acres produce at the same rate? 5 acres? 4 acres?

19. How many quarts of molasses are there in a barrel containing 32 gallons? In 5 barrels? In 7 barrels?

20. If apples bring $2.15 a barrel and I sell 2 barrels one day, 1 the next, and 2 on a third day, how much do I get? (What is the shortest way of working this example?)

21. What is the value of 18 five-dollar bills and 27 two-dollar bills?

22. Our garden is a square, each side of which is 120 ft. long. How many feet long must a fence be that incloses it? (What is the shortest way of working this example?)

23. Our neighbor's yard is a square, each side of which is 30 yd. long. How many feet of fence will be required to inclose the yard?

24. Find the area in square yards of a road 1250 yd. long and 5 yd. wide.

25. Find the cost of 2 quarts of oysters at 43¢ a quart and 3 quarts of milk at 7¢ a quart. If these are made into an oyster stew sufficient for ten persons and sold at 25¢ an order, what is the gain?

26. Find the cost of 3 loaves of bread at 8¢ a loaf, 2 pounds of honey at 15¢ a pound, and 1 pound of butter at 35¢.

27. Multiply each of the following at sight (*i.e.* orally without the use of pencil, or paper, or blackboard):

$$(1)\ \begin{array}{r}103\\ \underline{4}\end{array}\qquad (2)\ \begin{array}{r}41\\ \underline{3}\end{array}\qquad (3)\ \begin{array}{r}\$121\\ \underline{4}\end{array}\qquad (4)\ \begin{array}{r}\$306\\ \underline{2}\end{array}\qquad (5)\ \begin{array}{r}215\\ \underline{3}\end{array}$$

28. Work at sight Exs. 1–3, 13–18 of this section.

§ 75. Division by 2, 3, 4, and 5

1. Divide: $2)\underline{8\text{ apples}}$ $\qquad 2)\underline{8\text{ tens}}$ $\qquad 2)\underline{80}$

$2)\underline{8\text{ hundreds}}$ $\qquad 2)\underline{800}$ $\qquad 2)\underline{600}$

2. Find the value of 6 tens ÷ 3. 60 ÷ 3 80 ÷ 4
12 hundreds ÷ 4 $\qquad 4)\underline{1200}$ $\qquad 5)\underline{1000}$ $\qquad 4)\underline{2000}$

3. If 4 wagons cost $80, what will 1 wagon cost?

4. If 3 horses cost $900, what will 1 horse cost?

5. Divide 846 by 2.

Since 846 = 800 + 40 + 6, we may divide thus:

$$2\overline{)800+40+6}\quad\text{or more briefly}\quad 2\overline{)846}$$
$$400+20+3 \qquad\qquad\qquad\qquad 423$$

Hence we have the following:

Written Work	**Explanation**
2)846 423 *Quotient*	8 hundreds ÷ 2 = **4** hundreds (which write). 4 tens ÷ 2 = **2** tens (which write). 6 units ÷ 2 = **3** units (which write).

To test the accuracy of our work, we multiply the quotient by the divisor, thus: If the product = the original dividend, the work is probably correct.

$$\begin{array}{r} 423 \\ 2 \\ \hline 846 \end{array}$$

6. Divide each of the following by 2, and test the work in each case:

(*1*) 488 (*2*) 844 (*3*) 484 (*4*) 480 (*5*) 848 (*6*) 804

Also divide each of these numbers by 4.

7. Divide each of the following:

3)633 3)609 5)550 5)555 4)840

2)824 2)284 5)505 4)488 3)963

8. Divide each of the following, obtaining both quotient and remainder:

2)247 3)367 4)845 5)556 3)695 2)423

4)849 4)846 5)552 3)605 2)201 4)485

9. Thus far we have used two methods of expressing division, shown for instance in $693 \div 3$ and $3\overline{)693}$. From this time on we shall sometimes use still another method, as follows: $\frac{693}{3}$. The form, $\frac{1}{3}$ of 693, may also be regarded as a way of expressing division.

10. Find the value of

$693 \div 3$	$\frac{1}{3}$ of 306	$\frac{1}{4}$ of 884	$\frac{936}{3}$
$488 \div 4$	$\frac{1}{5}$ of 505	$\frac{1}{2}$ of 248	$\frac{844}{4}$
$\frac{1}{4}$ of 484	$555 \div 5$	$\frac{1}{3}$ of 936	$\frac{633}{3}$
$\frac{1}{2}$ of 600	$550 \div 5$	$\frac{1}{4}$ of 480	$\frac{500}{5}$

11. Subtract 3 from 63. Then subtract 3 again from the remainder thus obtained, and so on till there is no remainder. How many times have you subtracted?

Now divide 63 by 3.

Which of the two processes requires less labor? About how much less?

12. In 848 quarts there are how many gallons? In 480 quarts, how many gallons?

13. If 84 boys march 4 abreast, how many rows of boys will there be?

14. In 633 feet, how many yards are there?

15. If 484 trees are to be set out in 2 rows, how many trees will there be in each row?

To the Teacher The remainder of this section may be omitted till after long division has been studied, through § 99 (p. 251), at the option of the teacher

16. Divide 762 by 3.

WRITTEN WORK

$$\begin{array}{r|l} 3 & \underline{762} \\ & 254 \text{ Quotient} \end{array}$$

EXPLANATION

7 hundreds ÷ 3 = **2** hundreds, and 1 hundred left over (write 2 hundreds).

1 hundred (or 10 tens) + 6 tens = 16 tens.

16 tens ÷ 3 = **5** tens, and 1 ten over (write 5 tens).

1 ten + 2 units = 12 units.

12 units ÷ 3 = **4** units (which write).

17. Divide 762 by 5.

WRITTEN WORK

$$\begin{array}{r|l} 5 & \underline{763} \\ & 152\frac{3}{5} \text{ Quotient} \end{array}$$

EXPLANATION

7 hundreds ÷ 5 = **1** hundred, and 2 hundreds left over (write 1 hundred).

2 hundreds (or 20 tens) + 6 tens = 26 tens.

26 tens ÷ 5 = **5** tens, and 1 ten over (write 5 tens).

1 ten + 3 units = 13 units.

13 units ÷ 5 = **2** units, and 3 units left over (write 2 units).

3 units = the remainder, which write thus: $\frac{3}{5}$, to indicate the division by 5.

18. Divide each of the following by 5:

(*1*) 565 (*2*) 665 (*3*) 765 (*4*) 840 (*5*) 844

Also divide each of them by 4. Also by 3. Also by 2.

19. Find the value of

876 ÷ 3 $\frac{1}{5}$ of 325 $\frac{1}{4}$ of 496 $\frac{852}{4}$

928 ÷ 4 $\frac{1}{5}$ of 675 $\frac{1}{3}$ of 723 $\frac{576}{5}$

20. Count by 5's from 125 to 0, noting the number of times 5 is counted off.

Now divide 125 by 5. Which of the two processes is shorter?

21. In 926 quarts, how many gallons?

22. 4 is contained in 875 how many times, with how many units left over?

23. Four boys buy a rowboat for $ 10, each paying the same sum. How much does each pay?

24. If 75 boys march 5 abreast, how many rows of boys are there?

25. In 720 feet, how many yards?

26. If a barrel of flour contains 196 pounds, how many days will a barrel last a family which uses 2 pounds daily? 3 pounds? 4 pounds? 5 pounds?

27. If 168 cabbage plants are to be set out in 4 rows, how many plants will there be in 1 row?

28. Mr. Adams bought a house for $ 4800 to be paid for in 5 equal installments. How large must each payment be?

If he had bought another house for $ 3000, to be paid for in 4 payments, how large would each payment on that house have been?

29. Add:

(1)	*(2)*	*(3)*	*(4)*	*(5)*
123	475	858	$ 62.27	$ 138.23
431	384	372	37.05	92.73
204	896	721	87.27	387.21
120	400	876	16.91	45.03

30. Subtract:

(1)	(2)	(3)	(4)	(5)
3716	\$ 50.00	\$ 138.72	\$ 300.00	\$ 548.72
1437	29.16	49.27	137.25	100.09

Time yourself to see how quickly you can work Exs. 29 and 30. Make a note of the time, so that later, when you have had more practice, you can see how much faster you have learned to add and subtract.

31. Work Exs. 1–4 and 6–8 of this section as sight work.

32. Work Exs. 3–10 on pages 127–128 as sight work.

§ 76. Measurement of Length; Multiplication and Division Combined

1. How many yards in a mile?

Measures

$5\frac{1}{2}$ yards = 1 rod.
320 rods = 1760 yards = 1 mile.

This first line may be shortened to $5\frac{1}{2}$ yd. = 1 rd.

In what shorter way may we write the last line of the table?

2. How many yards in $\frac{1}{4}$ of a mile? In $\frac{1}{2}$ of a mile? In $\frac{1}{2}$ of $\frac{1}{4}$ (or $\frac{1}{8}$) of a mile? In 2 miles? In 3 miles? In $2\frac{1}{2}$ miles?

3. 3 ft. = 1 yd; how many feet in a mile? In $\frac{1}{2}$ mile? In $\frac{1}{3}$ mile?

4. If a boy can run $\frac{1}{2}$ mile in 3 minutes, how many feet does he run in 1 minute?

5. Thomas sold 46 papers on Monday, 52 on Tuesday, 60 on Wednesday, 49 on Thursday, 54 on Friday, and 75 on Saturday. What was the average number of papers he sold daily?

We find the average by adding these 6 numbers and dividing their sum by 6.

By what would you divide if there were 9 numbers? 3 numbers?

6. Look up the 5 longest rivers in the United States. What is their average length? (See p. 331.)

7. If a regiment of 925 men march 4 abreast, how many rows are there, and how many men are left over?

8. How many pounds in 5 barrels of flour? How many days will this last a family using 4 pounds of flour a day? (About how much longer would it take you to find this last result by repeated subtraction than by division?)

9. Using the following list of laundry prices, find the cost of laundering 5 collars, 2 pairs of cuffs, and 3 waists. 4 collars, 3 pairs of cuffs, and 2 waists.

Collars	2¢ each	Vests	25¢ each
Cuffs	4¢ a pair	Waists	20¢ each
Handkerchiefs . .	2¢ each	Shirts . . .	10¢ each

10. Make a probable laundry list for yourself for the next two weeks, and determine the cost.

11. In one week a boarding school has a laundry bill for 426 collars and 327 pairs of cuffs. What would the amount of the bill be, at the prices given in Ex. 9? If $\frac{1}{5}$

is deducted from the bill because the order is large, what would be the net amount of the bill?

A deduction from the amount of a bill is sometimes made for a large order or a cash payment. The amount paid is called the *net amount.*

12. Let each pupil make up 6 examples in addition using not more than 5 numbers of 3 figures each, and write each example on a small piece of paper. Place these papers in a box, and then let each pupil draw out one and work the example. The pupil who draws out and works correctly the largest number of examples in a given time wins the contest. The columns should be added down as well as up, to see if the sum is probably correct.

§ 77. Comparison

1. Compare 10¢ and 5¢; 10¢ is how many times as large as 5¢?

Proceed thus: 10¢ is twice as large as 5¢, for 5¢ is contained twice in 10¢.

2. Compare 12¢ and 4¢. 12¢ and 3¢. One dozen eggs and 4 eggs. 9 apples and 3 apples.

3. What will 10 apples cost, if 5 apples cost 3 cents?

Proceed thus: 10 apples are twice 5 apples; hence 10 apples cost 2 times 3 cents, or 6 cents.

4. If 3 quarts of cranberries cost 25¢, find the cost of 6 quarts. Also of 9 quarts. Of 12 quarts. Of 15 quarts.

5. If 3 picture postal cards cost 10¢, what will 6 cards cost? 9 cards? 12 cards?

6. If 4 books cost $4.15, what will 8 books cost? 12 books?

7. If 100 celery plants cost 40¢, tell the cost of 200 celery plants; 300; 400; 500; 150; 250.

8. If I can buy 6 pens for 5¢, how many pens can I buy for 10¢? For 15¢?

9. If I can buy 3 quarts of cranberries for 25¢, how many quarts can I buy for 50¢? For 75¢? For $1?

10. If I can buy 3 picture postal cards for 10¢, how many can I buy for 20¢? For 30¢? For 40¢?

11. If I pay 48¢ for 1 pound of pepper, what ought I to pay for 4 ounces? For 8 ounces? For 12 ounces?

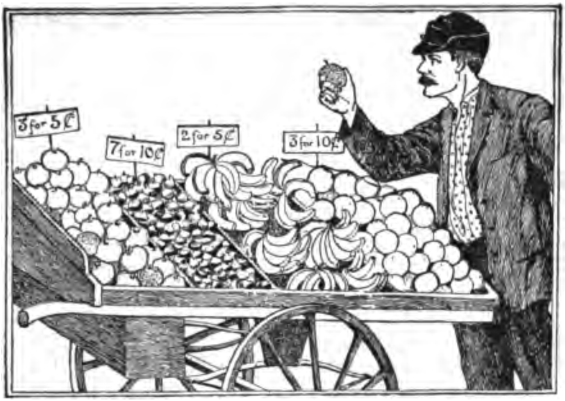
12. If I pay $ 18 for the use of a certain sum of money for one year, what ought I to pay for its use during March, April, and May?

13. A farmer raises 122 bushels of wheat on 8 acres. How much would he have raised if he had planted 16 acres?

14. Fruit is exposed for sale as follows:

3 for 5¢	7 for 10¢	2 for 5¢	3 for 10¢
Apples	Figs	Bananas	Oranges

Tell some of the ways in which you could spend 30¢ for fruit at this stand. Which of these ways would you prefer?



15. Make up 5 examples in subtraction using numbers of not more than 3 figures each, and treat these examples as in Ex. 12, p. 195.

16. On your squared paper mark off a line 12 spaces long. Let this stand for the length of 1 year.

Now mark off the part which represents the first three months of a year.

17. On the same paper mark the part of your line that represents a half year. $\frac{3}{4}$ of a year. The first nine months of the year. Name these months.

18. Mark off another line 10 spaces long. Let this stand for 1 dollar. Mark off the part which stands for 2 dimes. For 3 dimes. For 5 dimes.

19. Mark off a line to stand for 1 peck. Then on this line mark off a part to stand for 2 qt. For 4 qt.

20. Can you make a similar example about representing a pound and ounces?

21. Count by 9's from 8, 7, 6, 5, 4 with 100 as a limit, and reverse.

22. Work at sight as many of the examples on pages 135–136 as you can.

23. Recite the multiplication tables. From flash cards, see how quickly you can tell the products of 2, 3, 4, and 5 by the numbers from 1 to 12 when not taken in regular order.

§ 78. Multiplication by 6, 7, 8, and 9

1. What is multiplication? What is the use of multiplication; that is, how does multiplication save labor? Give an example of how multiplication saves labor.

Definitions

The **multiplicand** is the number taken or multiplied.

The **multiplier** is the number which tells how many times the multiplicand is taken.

2. What is the product? In your example in Ex. 1 point out the multiplicand, the multiplier, and the product.

3. Multiply 142 by 6.

WRITTEN WORK	EXPLANATION
142 *Multiplicand* 6 *Multiplier* 852 *Product*	Let the pupil write an explanation similar to that given on page 186.

Multiply the following, and write in connection with each example the words *multiplicand*, *multiplier*, and *product*, as is shown in Ex. 3:

4.	102	5.	112	6.	221	7.	423
	9		8		7		6

8. Multiply 213 by 5. By 6. By 8.

9. Multiply 324 by 7. By 9. By 6.

10. Multiply 456 by 4. By 8. By 9. By 7.

11. Multiply 658 by 3. By 8. By 9.

12. Multiply 709 by 6. By 11. By 12.

13. Multiply each of the following by 7:

(*1*) 213 (*2*) 806 (*3*) 508 (*4*) 680 (*5*) 712

14. Also multiply each of the numbers in Ex. 13 by 6. By 8. By 9.

15. How many rods are there in 1 mile? In 3 miles? In 6 miles? In 7 miles? In 8 miles? In 9 miles?

16. There are 365 days in one year. How many days are there in 5 years? In 9 years? In 11? In 12?

17. If a train runs 957 miles in a day, how far will it run in 4 days? In 7? In 12?

18. There are 196 pounds in a barrel of flour. How many pounds in 9 barrels? In 11? In 12? In 7?

19. If one acre of land is worth $ 475, how much are 7 acres worth? 9 acres? 12 acres? 5 acres?

20. There are 5280 feet in a mile. How many feet are there in 3 miles? In 4 miles?

21. At sight multiply each of the following by 6:

201 302 311 402 112 1102 508

22. Also at sight multiply the numbers in Ex. 21 by 7? By 8. By 9.

§ 79. Abstract Numbers; Use of the Multiplication Sign

1. Write in a briefer way: seven cents and five cents and 4 cents and 3 cents.

2. Combine 7¢ + 5¢ + 4¢ + 3¢ into a still briefer form

3. Can you reduce 7 horses + 5 cows to a single number? Can you reduce 7 animals + 5 animals to a single number?

4. "Animals" is a more general word than "horses" and "cows." Hence we see that by regarding different objects in a general way we can often combine their numbers into a simple form. This is one of the uses of *abstract* or *general number*. Later we shall find that abstract number has other uses.

5. In 5 cats + 4 dogs, change "cats" and "dogs" into some more general word, and simplify the result. Treat 7 horses + 8 pigs in like manner.

6. In 8 robins + 5 sparrows, change the words into a more general form and add.

7. In 12 boys + 9 girls, do the same.

8. Make up, and solve, an example similar to Ex. 6.

9. 7 + 6 = 13 is a short way of saying, "7 units + 6 like units = 13 units of this kind." Make up a similar example, using 9 and 4.

10. Show by pictures that 5 pears + 4 pears = 9 pears.

11. Do we now know, without showing, that 5 Bartlett pears + 4 Bartlett pears = 9 Bartlett pears?

12. Show by strokes that 5 ones + 4 like ones = 9 ones.

13. Do we now need to show that 5 boys + 4 boys = 9 boys? Or that 5 ones of any special kind + 4 ones of the same kind = 9 ones of that kind (as dollars, apples, etc.)? What are ones also called?

14. After showing that 7 units + 6 like units = 13 units, it is unnecessary to show that 7 apples + 6 apples = 13 apples. The same is true for any special kind of number. This shows another advantage in the use of abstract or general number.

15. Read the sign × in two ways.

Care must be used in reading products.

Thus, "8 × 5 apples" reads "8 times 5 apples"; but "5 apples × 8" reads "5 apples multiplied by 8."

16. If the sign × is read "multiplied by," does the multiplier come before or after the multiplicand?

17. If the sign × is read "times," does the multiplier come first or last?

18. Read 8 × 7, making 7 the multiplier. Now read it making 8 the multiplier.

Treat 9 × 4, 7 × 6, 4 × 5 in the same way.

Principle

The multiplier is always an abstract number, since it denotes a number of groups or times (the word *groups* or *times* not being written).

19. If the multiplier comes last, how do we read the sign × ? If first, how ? Give examples.

20. Read the following:

(*1*) 8 × 4 apples
(*2*) 4 apples × 8
(*3*) 9 × 3 marbles
(*4*) 3 marbles × 9
(*5*) 6 × 5¢
(*6*) 5¢ × 6
(*7*) 7 × $4
(*8*) 4 × 3 ft.
(*9*) 5 yd. × 7
(*10*) 8 pounds × 6
(*11*) 3 × 6 gloves
(*12*) 8 loaves × 6

21. Which is the multiplier in each of the above examples?

22. Add at sight:

23	31	62	44 pupils	$56	37¢	21¢
15	14	14	33 pupils	$21	12¢	50¢

23. Subtract at sight:

42	39	44¢	68¢	94¢
21	22	11¢	24¢	72¢

§ 80. Division by 6, 7, 8, and 9

1. What is division? What is the use of division; that is, how does division save labor? Give an example of how division saves labor.

Definitions

The **dividend** is the number to be divided.
The **divisor** is the number by which to divide.

2. What is the quotient? In your example point out the dividend, divisor, and quotient.

3. Divide 660 by 6.

WRITTEN WORK	EXPLANATION
Divisor, 6)660 *Dividend* 110 *Quotient*	Let the pupil write out an explanation, similar to that given in Ex. 5 on page 189.

How do you test your work to see whether you have found the correct quotient?

4. Divide, and write in connection with each example the words *divisor, dividend,* and *quotient,* as is done in the model example:

(*1*) 666 by 6
(*2*) 707 by 7
(*3*) 880 by 8
(*4*) 909 by 9
(*5*) 186 by 6
(*6*) 217 by 7
(*7*) 420 by 7
(*8*) 168 by 8
(*9*) 618 by 6
(*10*) 721 by 7
(*11*) 918 by 9
(*12*) 624 by 6
(*13*) $\frac{360}{6}$
(*14*) $\frac{490}{7}$
(*15*) $\frac{816}{8}$
(*16*) $\frac{909}{9}$

5. Divide:

(*1*) 667 by 6
(*2*) 779 by 7
(*3*) 809 by 8
(*4*) 701 by 7
(*5*) 669 by 6
(*6*) 910 by 9
(*7*) 710 by 7
(*8*) 810 by 8
(*9*) 665 by 6
(*10*) 930 by 9
(*11*) 843 by 7
(*12*) 889 by 8

6. If Harriet found 606 eggs in one month, and received $\frac{1}{6}$ of them for finding them, how many did she receive?

7. If a farmer raises 918 bushels of corn and sells $\frac{1}{9}$ of this, how many bushels does he sell?

To the Teacher. At the option of the teacher, Exs. 8–12 which follow may be omitted till after the class has studied long division through § 99 (p. 251).

8. **Divide each of the following:**

(*1*) 672 by 6
(*2*) 762 by 6
(*3*) 984 by 8
(*4*) $972 by 9
(*5*) $776 by 6
(*6*) 854 ft. by 7
(*7*) 952 in. by 7
(*8*) 846 by 6
(*9*) 1026 by 9

9. Divide each of the following by 6:

679 880 928 876 458 789 444 851

10. Also divide each of the numbers in Ex. 9 by 7. Also by 8. By 9.

11. If a farmer raises 672 bushels of potatoes on 6 acres, how many bushels does he raise on 1 acre?

12. If Walter earns $9.18 in 9 days, how much does he earn in 1 day?

Observe that $\frac{1}{9}$ of $9 is $1. Also that $\frac{1}{9}$ of 18 cents is 2 cents. The work may be arranged briefly thus: 9) $9.18
$1.02

13. How many of the examples in this section can you work at sight?

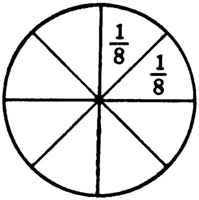
14. Work at sight as many of the examples on pages 146–147 as you can.

15. Work examples in addition and subtraction, using your box examples or others placed on the blackboard by the teacher.

§ 81. Fractions; $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$

1. If you had a pie and should divide it into 4 equal parts, what would each part be called?

2. If you should divide each of the fourths into 2 equal parts, what would each of these last parts be called?



3. How many eighths in $\frac{1}{4}$ of a pie?

4. How many eighths in $\frac{2}{4}$ of a pie? In $\frac{3}{4}$?

5. How many eighths in $\frac{1}{2}$ of a pie? Does $\frac{1}{2}=\frac{4}{8}$?

6. $\frac{1}{2}-\frac{1}{8}=\frac{4}{8}-\frac{1}{8}$. Show this on the above diagram. Show this also by folding a small square or oblong piece of paper.

7. If you should eat $\frac{1}{8}$ of a pie to-day and $\frac{1}{8}$ to-morrow, how many eighths would you eat in all? Does $\frac{1}{8}+\frac{1}{8}=\frac{1}{4}$?

8. If you had $\frac{1}{2}$ of a pie and should eat $\frac{1}{8}$ of the pie, how many eighths would you have left?

9. Would you rather have $\frac{3}{8}$ or $\frac{1}{2}$ of a pie?

10. What are the following parts of a pie?

$1-\frac{1}{2}$ $\quad 1-\frac{1}{4}$ $\quad \frac{1}{2}-\frac{1}{8}$ $\quad 1-\frac{1}{8}$ $\quad 1-\frac{3}{8}$

$\frac{1}{2}-\frac{1}{4}$ $\quad \frac{1}{4}-\frac{1}{8}$ $\quad \frac{5}{8}-\frac{1}{8}$ $\quad \frac{1}{8}+\frac{3}{8}$ $\quad \frac{1}{4}+\frac{1}{4}$

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<tr><td colspan="4">$\frac{1}{2}$</td><td colspan="4">$\frac{1}{2}$</td></tr>
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11. Show on the diagram adjoining that

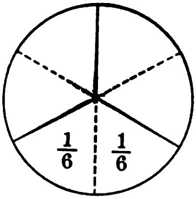
$\frac{1}{2}=\frac{2}{4}=\frac{4}{8}$

$\frac{1}{4}=\frac{2}{8}$ $\quad \frac{3}{4}=\frac{6}{8}$

Commit these results to memory.

12. If you had a pie and should divide it into 3 equal parts, what would each part be called?

13. If you should divide each of the thirds into 2 equal parts, what would each of these last parts be called?



14. How many sixths in a whole pie? In $\frac{1}{3}$ of a pie? In $\frac{2}{3}$? In $\frac{1}{2}$?

15. What are the following parts of a pie?

$1-\frac{1}{3}$ $1-\frac{1}{6}$ $\frac{1}{3}-\frac{1}{6}$ $\frac{1}{2}-\frac{1}{6}$ $\frac{1}{6}+\frac{1}{6}$ $\frac{1}{3}+\frac{1}{6}$

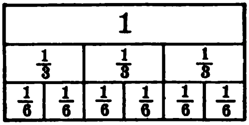
16. If you should eat $\frac{1}{6}$ of a pie to-day and $\frac{1}{6}$ of it to-morrow, what part of the pie would you eat all together?

17. Which is easier to write: $\frac{1}{6}+\frac{1}{6}$, or $\frac{1}{3}$?

18. Show on the adjoining diagram that

$$\frac{1}{3}=\frac{2}{6}$$
$$\frac{2}{3}=\frac{4}{6}$$

Commit these results to memory.



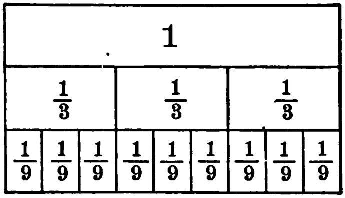
1
$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$
$\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$

19. Draw a circle to represent a pie, and divide it into 9 equal parts. What is each part called?

20. How many ninths in a third? In two thirds?

21. What are the following parts of a pie?

$1-\frac{1}{9}$ $1-\frac{2}{9}$ $\frac{1}{3}-\frac{1}{9}$ $\frac{2}{3}-\frac{1}{9}$ $\frac{1}{3}-\frac{2}{9}$ $\frac{2}{3}-\frac{4}{9}$ $1-\frac{5}{9}$



1
$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$
$\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$

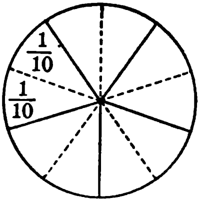
22. Show on the adjoining diagram that

$$1=\frac{3}{3}=\frac{9}{9}$$
$$\frac{1}{3}=\frac{3}{9}$$
$$\frac{2}{3}=\frac{6}{9}$$

Commit to memory these results.

23. By drawing from a box cards on which examples are written or printed, have a drill in addition and subtraction.

§ 82. Fractions; $\frac{1}{5}$, $\frac{1}{10}$, $\frac{1}{12}$



1. If you had a pie and should divide it into 5 equal parts, what would each part be called?

2. If you should divide each fifth into 2 equal parts, what would each of these last parts be called?

3. How many fifths in a whole pie? How many tenths in a whole pie?

4. How many tenths in $\frac{1}{5}$ of a pie? In $\frac{2}{5}$? In $\frac{3}{5}$? In $\frac{1}{2}$?

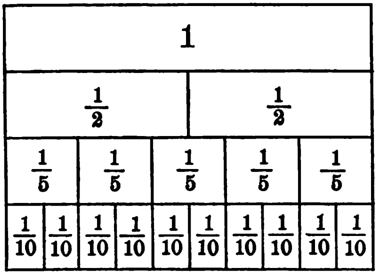
5. What are the following parts of a pie?

$1-\frac{1}{5}$ $\quad 1-\frac{3}{10}$ $\quad \frac{2}{5}-\frac{1}{10}$ $\quad \frac{1}{10}+\frac{1}{10}$

$1-\frac{1}{10}$ $\quad \frac{1}{5}-\frac{1}{10}$ $\quad \frac{2}{5}-\frac{3}{10}$ $\quad \frac{2}{5}+\frac{1}{10}$

6. Make three examples for yourself concerning fifths and tenths of a pie.

7. If you should have $\frac{1}{2}$ of a pie and should eat $\frac{1}{10}$ of a pie, how many tenths would you have left? How many fifths?



1
$\frac{1}{2}$ $\frac{1}{2}$
$\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$
$\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$

8. Show on the adjoining diagram that

$$1=\frac{5}{5}=\frac{10}{10}$$
$$\frac{1}{2}=\frac{5}{10}$$
$$\frac{1}{5}=\frac{2}{10}$$

Commit these results to memory.

9. Fold a piece of paper so as to show how many fifths in a whole. How many tenths in a whole. Tenths in one half.

10. Draw a circle to represent a pie and divide it into 2 equal parts. Divide each of these equal parts into 6 equal parts. Into how many equal parts have you divided the whole circle?

11. How many twelfths in a whole pie? In $\frac{1}{2}$ of a pie?

12. How many twelfths in $\frac{1}{4}$ of a pie? In $\frac{1}{3}$ of a pie?

13. If you had $\frac{1}{2}$ of a pie and should eat $\frac{1}{12}$ of a pie, how many twelfths would you have left?

A part of a unit, like $\frac{1}{2}$ or $\frac{2}{3}$, is called a *fraction.*

14. If on three successive days you should eat $\frac{1}{12}$ of a pie, what fraction of the pie would you eat in all?

15. What are the following parts (or fractions) of a pie?

$1-\frac{1}{12}$ $\quad\frac{1}{2}-\frac{5}{12}$ $\quad\frac{1}{3}-\frac{1}{12}$ $\quad\frac{1}{4}-\frac{1}{12}$

16. Commit to memory the following:

$$1=\frac{2}{2}=\frac{3}{3}=\frac{4}{4}=\frac{5}{5}=\frac{6}{6}=\frac{8}{8}=\frac{12}{12}$$

$$\frac{1}{2}=\frac{2}{4}=\frac{3}{6}=\frac{4}{8}=\frac{5}{10}=\frac{6}{12}$$

$$\frac{1}{3}=\frac{2}{6}=\frac{4}{12} \qquad \frac{2}{3}=\frac{4}{6}=\frac{8}{12} \qquad \frac{1}{3}=\frac{3}{9} \qquad \frac{2}{3}=\frac{6}{9}$$

$$\frac{1}{4}=\frac{2}{8}=\frac{3}{12} \qquad \frac{3}{4}=\frac{6}{8}=\frac{9}{12}$$

17. As the teacher names any fraction in Ex. 16, give orally all the fractions you can which are equal to it.

18. Work at sight as many examples on pages 150–151 as you can.

19. Review various forms of counting. After this, review the multiplication tables.

§ 83. The Square Foot and Square Yard; Estimating Length and Area

1. Arrange inch squares so as to form a square foot.

2. How many square inches in a square foot?

Measures

144 square inches = 1 square foot.

This may be shortened to 144 sq. in. = 1 sq. ft.

3. How many square inches in 2 square feet? In 3 square feet? In 5? In 9?

4. How many square inches in $\frac{1}{2}$ of a square foot? In $\frac{1}{4}$? In $\frac{1}{3}$?

5. Take the yardstick, and mark off a square yard on the blackboard, or floor, or on a paper spread on the floor.

6. How many feet in the yard measure? Mark off into square feet the square yard which you have made. How many square feet in a square yard?

Measures

9 square feet = 1 square yard.

This may be shortened to 9 sq. ft. = 1 sq. yd.

7. How many square feet in 2 square yards? In 3 sq. yd.? In 4 sq. yd.? In 5 sq. yd.?

8. If concrete pavement costs 90¢ a square yard, what will 5 square yards cost? Hence what will 20 square yards cost? What will 40 square yards cost?

9. Go to the blackboard without any measure and draw a straight line which you think is a yard long. Now measure the line which you have drawn. How many inches too long or too short is it?

10. How many inches long do you think the pencil box is? Now measure its length. Also estimate and then measure its width.

11. Draw on the blackboard a line which you think is 1 foot long. Also one 2 feet long. Now measure these lines.

12. Estimate the width and height of the door to the schoolroom. Now get the correct width and height by measuring them.

13. Draw a square which you think is a square foot. Measure it and see whether you have made it too large or too small. Likewise, try to draw a square yard.

14. Add:	763	3102	961	$72.15
	872	9761	519	92.18
	916	7432	874	61.09
	131	2010	910	123.17
15. Subtract:	5637	$48.63	$100.00	$200.00
	4294	27.49	58.72	137.92
16. Multiply:	673	$12.03	$21.05	$16.07
	5	4	3	5

17. Divide: 3)663 5)$20.05 4)$16.44 2)$202.46

18. A farmer went to town and sold 5 bu. of potatoes at 45¢ per bu., and 4 bu. of corn at 82¢ per bu. How much money did he receive?

He bought 5 lb. of sugar at 6¢ per lb., and 5 gal. of oil at 16¢ per gal. How much money did he spend? How much money did he have left?

19. Work the examples on pages 155–156 as sight work.

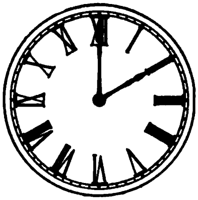
§ 84. Time of Day to the Minute

1. How many minutes are there in one hour?

Measures

60 minutes = 1 hour.

This may be shortened to 60 min. = 1 hr.



2. How many minutes in ½ hour? In ¼ hour? In ¾ hour? In ⅕ hour? In ⅓ hour?

3. Tell what III stands for. IV. VIII. XII.

4. Where are the hands of the clock at half-past four? At 2:15? At 2:20? At 2:22?

5. How long is it from 11 A.M. to 2:35 P.M.?

6. A telegram was sent at 9:15 A.M., and a reply received at 10:35 A.M. How long was the interval?

7. At 10:30 A.M., the cook put into the oven a cake which was to bake 40 minutes. Where would the hands of the clock be when the cake was to be taken out of the oven?

8. My train leaves at 8:41. It takes me 12 minutes to walk to the station. Show how the clock face will look when I must leave home.

9. If a boy can walk a mile in 15 minutes, how far can he walk in 1 hour?

10. If a motor car goes 6 miles in 20 minutes, how far does it go in 1 hour?

11. Write 62, 76, 99, 27, 29 in Roman notation.

12. Try to subtract LVII from XCIV. Now subtract 57 from 94. Which process is easier?

§ 85. Review

1. Without writing them, tell how many figures are necessary in writing seven hundred thirty. How many for seventy-two. For eight thousand fifty.

2. Write three thousand seven hundred ninety-five.
Also 3 thousands + 7 hundreds + 9 tens + 5 units.
Also 3 th. + 7 h. + 9 t. + 5 u. Also 3795.

The first statement is about how many times as long as the last? The second as the last? The third as the last?

3. In 7900, what does the 7 mean? The 9? Remove the two zeros. What does the 7 mean now? The 9?

4. Write six different numbers using the figures 2, 1, 5, 7. Which of these is the largest? Can you write still other numbers by the use of the given figures?

5. Read and add:

(*1*)	(*2*)	(*3*)	(*4*)
$ 327.12	$ 21.72	$ 28.96	$ 191.62
1056.14	133.12	427.62	42.76
592.17	5.09	3.07	89.30
310.21	100.05	51.72	199.28

Let the pupils or teacher write on the blackboard similar examples.

6. Find the difference between the sums obtained in (*1*) and (*2*) in Ex. 5; (*1*) and (*3*); (*1*) and (*4*).

Can you suggest other similar examples from Ex. 5?

7. Of the 897 pupils on the roll of our school, 107 are absent. How can I tell how many are present without the labor of counting them?

8. Our summer vacation has 72 days. 37 days are gone; how many are left?

9. How many years old are you? Write this number in Roman numerals.

10. How many years between 1775 and the present year? Name some important event which occurred in the year 1775.

11. Multiply:

612	$ 12.05	$ 240	$ 21.06
3	4	8	2

12. If wire costs 2¢ a foot, what will be the cost of a telephone wire 1 mile long? 2 miles long? 3 miles long? $2\frac{1}{2}$ miles long?

13. If wire costs 3¢ a foot, what will 2 miles of wire cost? 3 miles? 5 miles?

14. If I have $ 33 for hotel expenses, how many days can I stay at a hotel at $ 3 a day? Find this by successive subtractions. Now find it by division.

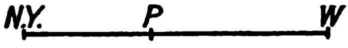
15. A steamer going across the Atlantic ran the following number of miles on 4 successive days: 512, 562, 523, 580. What was her average run per day?

16. If it is 3000 miles across the Atlantic Ocean, how far did the steamer in Ex. 15 still have to go at the end of the fourth day?

17. Find the number of years between the discovery of America (1492) and the landing of the Pilgrims at Plymouth (1620). Also between the latter event and the Declaration of Independence (1776). Also between the last named event and the close of the Civil War (1865). Which of these intervals is longest?

18. My father has a square garden, each side of which is 6 rods long. How many square rods in its area? How many rods of fence around it?

19. A friend of his has a garden 12 rods long and 3 rods wide. Find the area of this garden and the length of the fence around it. Which of the two gardens has the greater area? Which has the longer fence? How many rods longer? If the fence costs a dollar per rod, how much more will one fence cost than the other?



20. From New York to Washington is 228 miles. From New York to Philadelphia is 90 miles. How can the distance from Philadelphia to Washington be obtained?

21. On squared paper draw a diagram for each of the gardens described in Exs. 18 and 19.

22. If 3 spools of thread cost 18¢, what will 1 spool cost? 2 spools? 4 spools? 5 spools?

23. If 2 boxes of strawberries cost 25¢, what will 8 boxes cost? 12 boxes? 16 boxes?

24. If I can buy 3 watermelons for $1, how many can I buy for $2? For $3?

25. If 4 boxes of oranges contain 900 oranges, how many oranges will 1 box contain? 3 boxes? How many will 6 boxes contain? 9 boxes?

26. If oranges sell for 2¢ each, what will 3 boxes of oranges sell for?

27. How many of the examples in § 65 (p. 159) can you work at sight?

Let the pupil or teacher select other pages in Chapter III and treat them in the same way.

28. Review the process of making change by playing the restaurant game. (Use the bill of fare on page 110, or one supplied by the teacher, or one procured by a pupil from a local restaurant.)

29. Work again § 66 (p. 161). Also work again the examples in § 67.

30. Can you recite the multiplication tables without a mistake? Can you give correctly all the products of the multiplication tables, as the teacher calls for them in irregular order?

§ 86. Review: A Boy's Garden

1. Dudley has a garden 12 yards long and 8 yards wide. On your squared paper draw a diagram of this garden using 1 space to represent 1 yard.

2. If he should build a fence around his garden, he would need 14 posts at 50¢ (or $\frac{1}{2}$ dollar) each, and wire netting would cost him 3¢ a (running) foot. What would his fence cost him?

3. Dudley has divided his garden into four equal parts by lines through the middle of the four sides. Do this on your diagram.

4. He plants one part of his garden in cabbages. He plants 5 rows with 9 cabbage plants in each row. If he pays 10 cents for 6 cabbage plants, what do his cabbage plants cost him in all?

If he sells the cabbages he raises at 5¢ a head, how much money does he make on cabbages?

5. Dudley plants another part of his garden in potatoes. The potatoes which he plants cost him 20¢. He raises $1\frac{1}{4}$ bushels, which he sells at 20¢ a peck. How much does he make on potatoes?

6. He plants another part in peas. His seed costs him 15¢. If he raises 4 rows, from each of which he picks $2\frac{1}{2}$ pecks of peas, how many peas does he raise?

If he sells them at 30¢ a peck, how much money does he receive for his peas? How much money does he make on peas?

7. He plants the remaining part of his garden in lettuce. If he raises 6 rows with 20 heads in a row, how many lettuce heads does he raise?

If he sells these for 2 cents a head and his seed has cost him 10¢, how much does he make on lettuce?

8. If it cost him 60¢ to get his garden plowed, and he paid $1 for fertilizer, how much did he make from his whole garden?

9. On which part of his garden did he make the most? If he should next year plant his whole garden with the crop from which he has made most, how much money ought he to make?

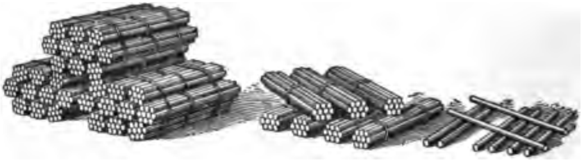
To the Teacher. See Note 32 concerning Practical Problems (p. 360).

CHAPTER V

NUMBERS THROUGH MILLIONS; MULTIPLICATION AND DIVISION BY NUMBERS CONTAINING TWO FIGURES

§ 87. Writing and Reading Numbers through Millions

1. Work again the examples in § 85 (pp. 212–215).



2. In the picture, how many hundreds of splints are there? How many tens? How many ones? What is the shortest way of writing three hundred seventy-eight?

3. How many units make a ten?
How many tens make a hundred?
How many hundreds make a thousand?
How many thousands make a ten-thousand?

4. Units, tens, hundreds, thousands, etc., are sometimes called *orders*.

Definition

A **unit** is a single thing of any given kind, or is a group of like things taken as a single thing.

Thus, one apple, one marble, one hat are examples of units. One foot contains twelve inches, but for many purposes one foot is taken as a unit. A dime also is a unit.

5. In numbering objects, it is the custom to group objects by *tens*, and to regard ten units of one order as a unit of the next higher order.

Principle

In writing numbers, ten units of one order = one unit of the next higher order.

Since the number *ten* governs in making a higher order of units, our system of naming numbers is called the ten-system, or *decimal system.* (The Latin word *decem,* from which we get the word *decimal,* means *ten.*)

6. Name three units which are single things.

7. Name some unit which is made up of single things taken together and regarded as one. Name two other such units.

8. In 3333, beginning at the right and going toward the left, what does the first figure 3 denote? The second? The third? The fourth?

9. In 3333 how many times greater is the value of the second figure from the right than that of the first? That of the third than that of the second?

Principle

Each figure in a number has a value ten times as great as if it were in the next place to the right.

10. In 1,365,278 what does 5 represent? 6? 3? 1?

million	hundred thousands	ten thousands	thousands	hundreds	tens	units
1,	3	6	5,	2	7	8

> *Definition*
>
> A **million** is a thousand thousand.

11. Which is easier to say: "a thousand thousand," or "a million"?

12. Read (do not use *and* in reading):

(*1*) 7,265,327	(*4*) 17,006,304
(*2*) 4,923,706	(*5*) 927,008
(*3*) 9,000,000	(*6*) 1,000,000

(*7*) The distance from the earth to the moon is about 240,000 miles.

(*8*) The area of New York State is 49,170 square miles.

(*9*) The area of Texas is about 266,000 square miles.

(*10*) The area of the United States is about 3,000,000 square miles.

(*11*) More exactly the area of the United States is 3,027,000 square miles.

13. How many people live in your city (or if you are in the country, how many live in the large city nearest your home)?

14. Write in figures:

(*1*) Seven hundred forty-six thousand three hundred seventy-two.

(*2*) Two million six hundred twenty-three thousand five hundred eighty.

(*3*) Five million six hundred thousand three hundred twenty.

(*4*) Eight million three hundred four thousand six hundred seven.

(*5*) One million one hundred thousand six.

15. Rewrite the following, shortening by the use of figures:

(*1*) In the year nineteen hundred ten the population of New York City was four million seven hundred sixty-six thousand eight hundred eighty-three.

(*2*) In the year eighteen hundred seventy the United States produced one million six hundred seventy thousand tons of pig iron.

(*3*) In the year nineteen hundred six the United States produced twenty-five million three hundred seven thousand one hundred twenty-one tons of pig iron.

16. If in paying $4367 you used only thousand, hundred, ten, and one-dollar bills, how many of each would you use? How many bills in all would you use? If you used only one-dollar bills, how many would you use?

17. What is the largest number which you can make with the figures 6, 7, 2, 8, 9, 1?

18. What is the largest number of 4 figures which you can write? Of 6 figures? Of 5 figures?

19. What number is 1000 greater than each of the following?

(*1*) 5275 (*2*) 6500 (*3*) 96,820 (*4*) 107,200

What number is 1000 less? 2000 greater? 2000 less?

20. Review the multiplication tables.

§ 88. The Ton; Roman Notation

1. How many ounces in a pound? In one half pound? In $\frac{1}{4}$ lb.? In $\frac{3}{4}$ lb.? In 2 lb.? In 5 lb.?

2. How many pounds in a hundredweight?

Measures

100 pounds = 1 hundredweight.

This may be shortened to 100 lb. = 1 cwt.

3. In 263 pounds, how many hundredweight? How many pounds over?

4. Do you know any objects that are sold by the hundred pounds, or hundredweight?

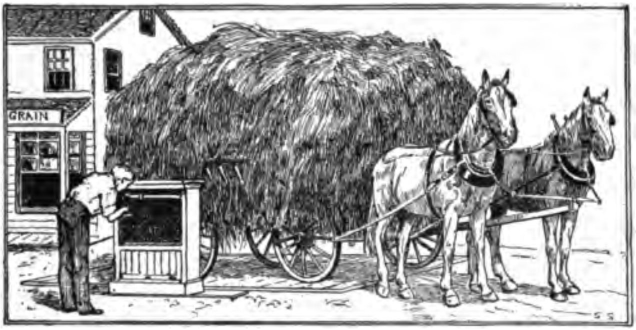
5. How many pounds in a ton?

Measures

2000 pounds = 1 ton.

This may be shortened to 2000 lb. = 1 T.

6. Can you name some materials that are usually sold by the ton?



7. In the picture the wagon and its load of hay weigh 5200 pounds. The wagon alone weighs 1200 pounds. How much does the hay weigh? How many tons of hay are there on the wagon?

8. Another load of hay on the same wagon weighed 5600 pounds. How many tons of hay were there? How many pounds left over? How many tons and how many hundredweight of hay was this?

9. How many pounds in 3 tons? In 5 tons? In 4 tons? In 8 tons? In 7?

10. How many pounds in $\frac{1}{2}$ of a ton? In $\frac{1}{4}$ of a ton? In $\frac{1}{5}$? In $\frac{1}{8}$? In $\frac{3}{4}$? In $2\frac{1}{2}$ tons?

11. If 5 tons of hay are worth $ 60, what is 1 ton worth? 2 tons? 3 tons? 4 tons?

12. If 2 tons of hay may be bought for $ 25, what will 4 tons cost? 6 tons?

13. Seven people weighed as follows: 125 lb., 169 lb., 66 lb., 120 lb., 154 lb., 182 lb., and 109 lb. How much did they weigh together? How much less than a ton is this?

14. Give the product of each number in the upper row by each number in the lower row. Make a list of all the products you cannot give correctly and quickly. Study this list.

7	6	1	3	5	2	4	9	8
7	2	8	4	9	3	6	1	5

15. In the Roman notation, what do I, V, X, L, C stand for?

16. Read XII; LXII; XXII; XLIV; XXIX; LVI.

17. CC = 200. What does CCC = ?

CC = 200
CCC = 300
CD = 400
D = 500
DC = 600
DCC = 700
M = 1000

18. Read DCXXII; CCLXI; MDCCCLXII.

19. Write in Roman symbols 762; 1032; 1908.

20. Work at sight as many of the examples on pages 160–161 as you can.

§ 89. Addition to Five Places; Abstract Numbers

1. What is addition? What is the use of addition; that is, how does addition save labor? Give an example of how addition saves labor.

2. What is a sum? Give an example of a sum.
What are addends? What are the addends in your example?

3. Give quickly the sum of each of these columns, adding down after adding up:

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
8	9	7	7	8	4	6	1
2	4	5	8	4	6	8	7
7	2	3	5	2	5	3	6
6	7	6	2	7	8	5	5
5	3	4	6	5	1	2	4
3	4	2	4	3	9	7	6
1	5	5	7	6	5	4	8
7	6	3	3	2	8	6	9

4. Add:

(1)	*(2)*	*(3)*	*(4)*	*(5)*
5689	4780	2896 ft.	8423	$ 2404
3792	7642	8342 ft.	286	100
4358	5036	257 ft.	7392	1965
2103	7827	3261 ft.	6790	1863

5. Add:

(1)	*(2)*	*(3)*	*(4)*	*(5)*
$ 14.65	$ 19.41	$ 25.76	$ 76.41	$ 37.38
21.43	32.34	32.37	47.69	3.25
64.61	34.42	54.61	31.04	46.73
37.28	15.73	16.45	83.26	28.41
43.24	62.64	67.38	27.13	7.50
46.03	45.76	34.92	74.52	63.04

6. If a miller has 3289 bushels of oats, 4765 bushels of corn, 2763 bushels of rye, and 8576 bushels of wheat, how many bushels of grain has he in all?

7. Four men have respectively $ 9763.41, $ 7169.73, $ 8563.27, and $ 4763.19. How much money have they together?

8. In one trainload of coal there were 4763 tons, in another 8755 tons, in a third 4958 tons, and in a fourth 3908 tons. How many tons of coal in all the trains?

9. Find the area of each of the New England states in square miles, and then find their total area taken together.

10. Make a list of the states outside of New England which are each less than 40,000 square miles in area, and find the sum of their areas.

Definitions

Concrete number is number of any particular kind.

Abstract number is number so general that we leave off its special name or mark.

Thus, 7 apples, $ 5, 8 ft. are concrete numbers.

In 7 + 6 = 13, we use abstract numbers, because this is a short way of writing or saying, "7 units + 6 like units = 13 units of the given kind."

"7 × 8 apples" is a short form for "7 groups of 8 apples each." 7 in this case is an abstract number. This illustrates one of the uses of abstract number. Abstract number can be written briefly.

11. In 7 horses + 4 cows, change "horses" and "cows" to some more general words, so that you will be able to add the given numbers.

In "7 animals + 4 animals = 11 animals," *animals* is a partly abstract term which enables us to add numbers which otherwise could not be added. This illustrates another use of abstract number.

12. After we have determined that eight units of any one kind + 3 like units = 11 units of the given kind (or that $8 + 3 = 11$), as by use of splints or blocks, do we then need to show that 8 apples + 3 apples = 11 apples, by putting the apples together and counting them?

This illustrates a third use of abstract number. Abstract number saves us the labor of dealing one by one with a multitude of particular kinds of concrete numbers.

13. Point out the concrete numbers and the abstract numbers in the following:

8 marbles 9×3 peaches $7 + 4 = 11$ 4×3 oranges
$15 - 7 = 8$ 6 bu. $\frac{1}{3}$ of 21 quarts

14. Add 36 and 21 mentally or at sight (that is, without the use of any written work).

We add 20 to 36 and say 56; we then add 1 to 56 and say 57.

That is, we add the tens' figure of one number to the whole of the other number, and then add the remaining units' figure. The reason for proceeding thus is that in reading and taking in numbers at a glance we begin at the left. Owing to the habit thus formed, we carry numbers in our minds more readily by beginning at the left.

15. Add at sight:

(*1*) $\begin{array}{r}46\\ \underline{21}\end{array}$ (*2*) $\begin{array}{r}47\\ \underline{12}\end{array}$ (*3*) $\begin{array}{r}48¢\\ \underline{13}\end{array}$ (*4*) $\begin{array}{r}55¢\\ \underline{41}\end{array}$ (*5*) $\begin{array}{r}\$72\\ \underline{12}\end{array}$

Also subtract the same numbers at sight.

16. Count by 8's from each number smaller than 8 to 100 as a limit, and reverse each counting. By 7's. By 9's

§ 90. Subtraction to Five Places

1. What is subtraction? What is the use of subtraction; that is, how does it save labor? Give an example of how subtraction saves labor.

Definitions

The **subtrahend** is the number which is deducted in subtraction.

The **minuend** is the number from which the subtrahend is deducted.

2. What is the result of a subtraction called? In the following example point out the minuend, subtrahend, and difference:

$$\begin{array}{r}33912\\ \underline{29581}\\ 4331\end{array}$$

In subtraction, how can you find out if your work is probably correct?

3. Subtract and test your work:

(*1*)	(*2*)	(*3*)	(*4*)
7623	3100	$ 65.82	42,763 ft.
4175	2775	37.19	29,148 ft.

(*5*)	(*6*)	(*7*)	(*8*)
92,476 miles	$ 10,000	55,000 ft.	43,764
43,562 miles	4,971	29,998 ft.	19,999

4. Subtract and test your work:

(*1*)	(*2*)	(*3*)	(*4*)
$ 21.72	$ 76.48	$ 45.00	$ 50.00
13.62	19.01	27.16	10.76

(5)	*(6)*	*(7)*	*(8)*
$100.00	$150.00	$500.00	$657.72
75.03	7.12	230.04	399.42

5. From a heap of coal containing 7965 tons, 3794 tons were sold. How many tons remained?

6. In a certain election, the successful candidate received 2716 votes, which was a majority of 282. How many votes did the unsuccessful candidate receive?

7. How many years is it since the Declaration of Independence of the United States was made?

8. Make a list of the New England states with the area of each. Find the total area of the New England states. Do the same for the five Middle Atlantic states. Find the difference in area of the two groups of states.

How many additions have you used in this example? How many subtractions?

9. On a certain field a farmer last year raised 2786 bushels of corn. This year he planted selected corn, and his crop was 3792 bushels. What was the gain?

10. Mark off a line on the floor which you think is 5½ yards long. Now measure it with the tape to see whether it is too long or too short. 5½ yd. = ?

11. Work the following examples at sight:

(1) Subtract (subtract tens' figure first):

36	27	48¢	$95	55¢
21	12	23	72	30

(2) Multiply	13	21	16	23	61	72	212
by	5	4	2	3	5	4	3

12. Divide:

2)42 3)63 4)88 5)75 3)363 2)242 8)808

13. If the price of 1 can of string beans is 11 cents, what will be the cost of 5 cans?

14. If beefsteak costs 22 cents a pound, what will 4 lb. cost?

15. If 3 lb. of cheese cost 39 cents, what is the price of 1 lb? Of 2 lb.? Of 4?

16. Recite the multiplication tables in turn, each pupil giving one fact. On the blackboard let the teacher keep a list of all facts not given correctly and quickly. Study the list for five minutes; have it erased, and then see if you can give every fact without hesitation.

§ 91. Two Steps in Analysis; Comparison

1. If 4 lb. of sugar cost 24 cents, what will 1 lb. cost? 3 lb.?

2. If 3 tons of coal cost $18, what will 1 ton cost? 5 tons?

3. If 8 cords of wood cost $32, what will 9 cords cost?

4. If 7 bales of hay weigh 1680 lb., what will 3 bales weigh?

5. If 3 lb. of coffee cost $1, what will 6 lb. cost? 9 lb.? 12 lb.?

6. If 4 lb. of sugar cost 24 cents, what will 3 lb. cost?

7. If 3 tons of coal cost $18, what will 5 tons cost?

8. If 3 cans of corn cost 30 cents, what will 4 cans cost?

9. If 5 copies of a magazine cost 75 cents, what will 6 copies cost?

10. If 8 acres of land produce 240 bushels of oats, how many bushels will 9 acres produce at the same rate?

11. If 5 suits of clothes cost $82.50, what will 8 suits cost?

12. If an ocean steamer travels 3072 miles in 6 days, how many miles ought she to go in 9 days?

13. If 4 lb. of sugar cost 24 cents, what will 8 lb. cost? First work this example by comparing 8 lb. with 4 lb. Then work it as you worked Ex. 1. Which way of working the example is shorter?

14. If 7 tons of coal cost $56, what will 21 tons cost? Work this example as in Ex. 1; then work it by comparison, to find out for yourself that the latter is shorter. In which way are you more likely to make a mistake in your work, the longer or the shorter way?

15. If 5 tons of hay cost $67.50, what will be the cost of 10 tons? 15 tons? 45 tons?

16. If — cans of tomatoes cost — cents, what will — cans cost? Fill in the blanks with probable numbers, and work the example.

17. Make and work five examples similar to Ex. 16.

18. On squared paper draw a diagram to represent a croquet ground 20 yards long and 15 yards wide. If this ground is surrounded by a curb made by boards sunk in the ground, how long is the curb? What does the curb cost at 7 cents a foot?

19. Work Exs. 1–7 of this section as sight work.

§ 92. Review

1. By use of some drill, review the multiplication tables; give each table in reverse order also.

2. Review the division facts in the same way.

3. Find the value of 7 × 3¢ plus 3 × 5¢. Of 6 × 4¢ plus 5 × 8¢. Of 7 × 6 plus 4 × 3.

4. Four 3's + five 3's are how many 3's?

Find the value of 4 × 3 plus 5 × 3 in shortest way.

5. 3 times $674 plus 2 times $674 are how many times $674?

Find 3 × $674 plus 2 × $674 in the shortest way.

6. Find 2 × $1067 plus 3 × $1067 in the shortest way.

7. If one ton of hay is worth $16, what are 500 pounds of hay worth? 1500 pounds?

8. How many years was it from the discovery of America to the Declaration of Independence?

9. Work Exs. 4 and 5, p. 175.

10. Work Ex. 3, p. 178.

11. Walter has $37.50 in the savings bank. How much more must he save in order to have $100?

12. Harry took a half-dollar and a quarter, and bought 9 pounds of sugar at 6 cents a pound. How much change did he receive?

13. Arthur took a dollar to the store, and bought a hatchet for 37 cents and 9 pounds of nails at 4 cents a pound. How much change did he get?

14. Mrs. Adams has 50 cents in the house. How many quarts of strawberries can she buy at 7 cents a quart? How much change will she receive?

15. If 8 barrels of apples cost $ 24, what will one barrel cost? 7 barrels?

16. A trolley car goes 40 miles in 5 hours; how far will it go in 1 hour? In 9 hours?

17. If 2 quarts of cherries cost 25 ¢, what will 8 quarts cost? 10 quarts? 16 quarts?

18. If 3 tennis balls cost $ 1, what will 6 tennis balls cost? 9? 12?

19. If 4 lb. of grapes cost 15 ¢, how many pounds can be bought for 30 ¢? For 60 ¢?

20. If a street car travels 7 blocks in 9 minutes, how far will it travel in 18 minutes? In an hour and a half?

21. Add:

(1)	*(2)*	*(3)*	*(4)*	*(5)*
273	$ 427	$ 89.12	$ 76.38	$ 37.62
462	516	72.13	123.17	48.72
512	912	62.05	56.19	9.16
908	312	1.99	42.13	3.72
384	635	42.27	7.05	4.23

22. Subtract:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)
2137	$ 62.72	$ 10.00	$ 50.00	$ 68.92
1085	31.94	9.37	37.24	23.42

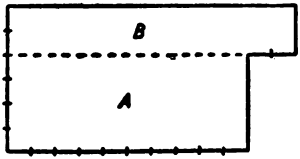
23. Multiply:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)
720	540	772	$ 8.94	$ 10.34
8	6	5	7	9

24. Divide each of the following by 6:

(*1*) 5040 (*2*) 5544 (*3*) 2574 (*4*) 7560
(*5*) 6048 (*6*) 8568 (*7*) 6818 (*8*) 9006

25. Also divide each of the numbers in Ex. 24 by 7. By 8. By 9.



26. This is the diagram of a field; each space in the bounding lines stands for 1 rod. Find the perimeter and area of the field.

27. Find the value of 3 × 7 × 8 × 5. Of 6 × 4 × 3 × 2. Of 7 × 5 × 8 × 3.

28. Marion had the following marks in her last report: arithmetic 82, grammar 86, reading 92, spelling 88, geography 96, history 94. What was her average grade?

29. Find the average size of the 6 New England states. Also of the 5 middle states. Find the difference in these average sizes.

30. How many yards in $\frac{1}{8}$ of a mile? How many feet?

31. A storekeeper's receipts for the days of the week were as follows: Monday $ 212.52, Tuesday $ 313.50, Wednesday $ 307.20, Thursday $ 310, Friday $ 316.42, Saturday $ 472.36. What were his average daily receipts?

32. I bought a bill of hardware which amounted to $ 240 by the catalogue prices, at a reduction of $\frac{1}{6}$ for paying cash. What did I pay?

33. Find the value of $\frac{720}{8}$. Also of $\frac{648}{8}$. Also the difference between the two quotients. Now compute: $\frac{720-648}{8}$ or $\frac{72}{8}$ = ?

Which way of getting the result is easier?

34. On a field containing 9 acres Mr. S. some years ago raised 369 bushels of corn. This year by planting selected seed and by improved methods of cultivation he raised 720 bushels. What has been the increase per acre? What two ways are there of calculating this gain? Which is easier?

35. Add at sight:

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
34	37	57	15¢	$ 13	$ 22
24	24	13	72	67	31

(7)	*(8)*	*(9)*	*(10)*	*(11)*
$ 10.15	$ 25.17	$ 20.18	$ 32.24	$ 51.23
31.10	44.11	27.11	10.13	32.42

36. Subtract at sight:

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
38	32	54¢	63¢	$ 46	$ 24.56
15	15	16	25	27	12.83

37. How many other examples in this section can you work at sight?

38. Invent some number game by which to fix in mind the primary products (or quotients) learned in the tables. If you cannot do this, use one of the games with which you are familiar.

§ 93. Multiplication by 2-Figured Numbers Ending in Zero

1. Count by 10's from 10 to 100. Repeat the multiplication table for 10.

2. Read correctly, supplying each product:

$10 × 6 = ? 10 × 7¢ = ? $5 × 10 = ? 8¢ × 10 = ?
10 × 8 apples = ?

3. If one coat costs $9, what will 10 coats cost?
10 × $9 = ?

4. Multiply 562 by 10.

WRITTEN WORK	EXPLANATION
562 10 5620 *Product*	10 times 2 = 20 = 2 tens + 0 units (write 0 units). 10 × 6 tens = 60 tens. 60 tens + 2 tens = 62 tens = 6 hundreds + 2 tens (write 2 tens).

10 × 5 hundreds = 50 hundreds.
50 hundreds + 6 hundreds = 56 hundreds (which write).

Hence:

Principle and Rule

The short way to multiply a number by 10 is to annex a zero to the given number.

5. Multiply:

(1)	*(2)*	*(3)*	*(4)*	*(5)*
689	$527	5280 ft.	1760 yd.	3000
10	10	10	10	10

6. Find by trial how much easier it is to multiply 689 by 10 than to set down 689 ten times and add.

7. Multiply 67 by 30.

WRITTEN WORK

67
30
2010 *Product*

EXPLANATION

30 = 3 × 10. Hence, to multiply a number by 30, we may first multiply the number by 3 and then by 10 (that is, annex a zero).

Hence:

Principle and Rule

The short way to **multiply by a 2-figured number ending in zero** is to multiply by the first figure of the number and then annex a zero to the product thus obtained.

8. Multiply:

(1)	*(2)*	*(3)*	*(4)*	*(5)*
56	112	$76	237 inches	6210
40	30	50	90	80
(6)	*(7)*	*(8)*	*(9)*	*(10)*
1000	3000 ft.	$1200	$2050	$1510
30	60	20	30	70

9. Multiply each of the following numbers by 20:
(*1*) 36 (*2*) 42 (*3*) 916 (*4*) 1080 (*5*) 6072 (*6*) 3200

10. Also multiply each of the numbers in Ex. 9 by 30, 40, 50, 60, 90, 70.

11. How many feet in 20 miles? In 30 miles? In 50 miles? In 90 miles? How many yards in each of these distances?

12. If one bushel of wheat weighs 60 lb., how much will 212 bushels weigh? 1200 bushels?

13. Find the number of square feet in a garden 32 ft. long and 20 ft. wide. How many feet of fence would be required to inclose the garden?

14. One man received 40¢ a bushel for picking cranberries. During 3 weeks he picked 42 bushels. During the same time a man using a scoop gathered 212 bushels at 20¢ a bushel. Which of the two men earned more money?

15. One quire of paper contains 24 sheets; how many sheets in 20 quires? What is the cost of 20 quires at ½¢ a sheet?

16. Work Exs. 2–10 of this section as sight work.

§ 94. Multiplication by Small 2-Figured Numbers; Rectangles

1. Multiply 546 by 32.

	Work in Full	Short Form of Work
Multiplicand	546	546
Multiplier	32	32
1st Partial Product	1092 = 2 × 546	1092
2d Partial Product	16380 = 30 × 546	1638
Entire Product	17472 = 32 × 546	17472 *Product*

The preceding is the customary form in which multiplication of this kind is done, but some teachers prefer the following form:

$$\begin{array}{rl} 546 & \\ \underline{32} & \\ 16380 & = 546 \times 30 \\ \underline{1092} & = 542 \times 2 \\ 17472 & \textit{Product} \end{array}$$

This form has the advantage of putting the largest partial product first; and hence of teaching us to make estimates of the general size of a product before we finish the work; and also of enabling us to stop the work (especially in the more extended examples to be given later) at any desired point of accuracy.

2. Multiply:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)	(*6*)
212	514	$762	$1920	1760 ft.	5280 ft.
13	31	21	12	22	41

(*7*)	(*8*)	(*9*)	(*10*)
76 × 9 × 13	90 × 8 × 20	14 × 14 × 20	32 × 8 × 60

3. Multiply each of the following numbers by 21:

(*1*) 316 (*2*) $425 (*3*) 1760 yd. (*4*) 1728 (*5*) 5280 ft.

4. Multiply each of the numbers in Ex. 3 by 32, 43, 51, 62, 73, 93.

5. How many feet in 12 miles? In 31 miles? In 42? 65? 84?

6. Estimate how much more labor there is in setting down 728 twelve times and adding, than in multiplying 728 by 12.

7. How many bushels of wheat would a field of 255 acres yield at 21 bushels per acre? What would this be worth at 80 cents per bushel?

8. What will it cost to send a cablegram of 21 words from New York to London at 25 cents a word?

9. How many sheets in 43 quires of paper?

10. Which is easiest to write: two feet five inches, or 2 ft. 5 in., or 2′ 5″?

The abbreviation 2′ 5″ is much used on diagrams, since the space on diagrams is small, and since, also, we do not wish to hide the lines of the diagrams by unnecessary letters.

11. Draw diagrams to represent the following rectangles and mark on them the length of the sides in the shortest way. Then find the perimeter of each rectangle.

"Rectangle 7 ft. long and 3 ft. wide" is sometimes shortened to "rectangle 7 ft. × 3 ft.," the sign × being read "by."

(*1*) 7 ft. × 3 ft.	(*3*) 1 ft. 3 in. × 8 in.
(*2*) 2 ft. × 6 in.	(*4*) 1 ft. 2 in. × 7 in.

12. At sight give the perimeters of the following oblongs:

(*1*) 3 ft. by 2 ft.	(*3*) 5 yd. by 2 yd.
(*2*) 6 in. by 4 in.	(*4*) 5 ft. × 5 ft.

13. Find the area of a rectangle 32 ft. long and 21 ft. wide.

14. On a lot of ground 30 ft. by 60 ft., a house 15 ft. by 20 ft. is built. How much ground is left for a yard about the house? By aid of squared paper, draw a diagram of the lot with the house on it. Can you draw this diagram in more than one way?

15. A concrete pavement is laid 27 yd. long and 6 ft. wide at 12¢ per sq. ft. What will be the cost?

16. Construct a rectangle 4 in. on one side and containing 12 sq. in. How long is the other side?

We divide the area by the given dimension to find the other dimension. The length and width of a rectangle are called its ***dimensions***

17. If a rectangle is 5 inches wide and contains 35 sq. in., how long is it? Make up, and work, two examples similar to this.

18. A box is 6 in. long and there are 30 sq. in. in the top. How wide is the box? The side of the box contains 18 sq. in. How high is the box?

§ 95. Multiplication Shortened by Reversing; Shortening Combined Operations

1. Multiply 9 by 37. Also multiply 37 by 9.

$$\begin{array}{rl} 9 & \\ \times 37 & \\ \hline 63 & \\ 27 & \\ \hline 333 & \textit{Product} \end{array} \qquad\qquad \begin{array}{rl} 37 & \\ \times 9 & \\ \hline 333 & \textit{Product} \end{array}$$

2. How many figures are used in the first process? How many in the second? Which process therefore is the shorter?

Principle

In multiplying together a large and a small number, it saves labor to multiply the large number by the small, rather than the reverse.

3. Multiply each of the following in two ways and point out the shorter way in each case:

(*1*) 9 × 72 (*2*) 81 × 7 (*3*) 72 × 5 (*4*) 317 × 8 (*5*) 672 × 6

4. How much will 735 pounds of sugar cost at 4¢ a pound?

Written Work

735
4 (¢)
$29.40 *Cost*

Explanation

We may perform this work as it is done at the left provided we read it "735 times 4¢." The ¢ is inclosed in parentheses to show that we read the × sign in a different way from that usually followed in such arrangements of the multiplicand and multiplier.

Work the following in the shortest way:

5. If the price of sugar is 5¢ a pound, find the cost of 756 pounds.

6. If the price of flour is 4¢ a pound, find the cost of 1250 pounds.

7. If 1 acre produces 41 bushels of corn, how many bushels will 672 acres produce? 787 acres? 1250 acres?

8. 12 times 256 and 9 times 256 are how many times 256 in all? Find the product of 12 × 256. Also of 9 × 256. Take the sum of the two products. Now find the product of 21 × 256. Which process is the shorter?

9. Find in the shortest way the value of

(*1*) 19 × 572 plus 13 × 572.
(*2*) 39 × $6758 less 26 × $6758.
(*3*) 5762 bushels × 176 less 5672 bushels × 173.

10. A field of 641 acres produced 37 bushels of corn per acre one year. Being planted with selected seed, it yielded 59 bushels the next year. Find the total increase in the yield. What was this worth at 72¢ per bushel?

11. What is the difference in cost between traveling 2540 miles at 2½¢ a mile and traveling the same distance at 2¢ a mile?

12. What is the difference in cost between 2768 lb. of iron wire at 3¼¢ a pound and the same at 3¢ a pound?

13. What is the difference in cost between having 3000 bushels of cranberries picked at 40¢ a bushel by hand, and having them picked by scoops at 15¢ a bushel?

14. Practice addition, using the "Tally Game."

To the Teacher. — See Note 30 concerning Tally Game (p. 359).

§ 96. Division by 2-Figured Numbers Ending in Zero

1. How many tens in 50? 50 ÷ 10 = ? 90 ÷ 10 = ? 80 ÷ 10 = ? 70 ÷ 10 = ? $10\overline{)90}$ $10\overline{)60}$ $10\overline{)40}$
 ? ? ?

2. How many tens in 100? In 400? 400 ÷ 10 = ? 800 ÷ 10 = ? 600 ÷ 10 = ? $10\overline{)700}$ $10\overline{)500}$ $10\overline{)900}$
 ? ? ?

3. 420 ÷ 10 = ? 4200 ÷ 10 = ? 6300 ÷ 10 = ?

> *Principle and Rule*
>
> If a number ends in zero, the short way to **divide the number by 10** is to remove the zero from the end of the given number.

4. A man bought 10 coats for $120; what did each coat cost?

5. I paid $240 for the rent of a house for 10 months; what was the rent per month?

6. $\frac{60}{20} = \frac{6 \text{ tens}}{2 \text{ tens}} = 3$ Hence $\frac{80}{20} = ?$ $20\overline{)80}$? $30\overline{)90}$?

7. $\frac{600}{20} = \frac{60}{2} = 30.$ Hence $\frac{900}{30} = ?$ $30\overline{)600}$? $40\overline{)1200}$?

Principle and Rule

If a dividend and divisor both end in zero, the short way to divide is to remove the zero from the end of both and divide one remaining number by the other.

8. I bought 20 tons of coal for $140. What was the price per ton?

9. A postman delivered 240 pieces of mail in one hour. How many pieces did he deliver per minute, on the average?

10. 70 acres of land produced 2100 bushels of corn. What was the yield per acre?

11. 40 acres of land yielded 14,000 lb. of cotton. What was the yield per acre?

12. If it is 3000 miles from New York to San Francisco, how many hours would it take a train to go from the one city to the other at the average rate of 50 miles an hour?

13. Divide 8749 by 40.

WRITTEN WORK

$4\cancel{0})\underline{874}\,\boxed{9}$

218 *Quotient;* 29 *Remainder*

or $218\frac{29}{40}$ *Complete Quotient*

EXPLANATION

Set aside the 9 and strike out the zero at the end of 40. Divide 874 by 4. The remainder 2 must be placed before 9 to make the complete remainder.

If desired, the complete remainder may be placed over the divisor in the form of a fraction and written as part of the quotient.

The reason for the above process may be more clear when the process is explained in the following way:

$\frac{8749}{40} = \frac{8740}{40}$ with Remainder 9

$= \frac{8720}{40}$ with Remainder 29

= 218 Quotient, with Remainder 29.

14. Divide each of the following numbers by 30:

(*1*) 5462 (*2*) 7485 (*3*) 6920 (*4*) 86,952 (*5*) $704

Also divide each of them by 50. By 80. By 90. By 20. By 70.

15. Divide:

(*1*) $70)\underline{6954}$ (*2*) $80)\underline{50723}$ (*3*) $50)\underline{9542\text{ ft.}}$ (*4*) $40)\underline{\$\,9437}$ (*5*) $60)\underline{\$10030}$

16. Richard can run $\frac{1}{4}$ of a mile in one minute. How many feet does he run? How many feet does he run in one second?

17. If a bushel of wheat weighs 60 pounds, 6275 pounds of wheat are how many bushels, with how many pounds left over?

18. A man buys 6 tons of hay for $40 and sells it for 50¢ per hundredweight. How much does he make?

19. The attendance in a certain school on the different days of one week was 581, 623, 592, 596, and 618 pupils. What was the average daily attendance?

20. Let the Eiffel tower be taken as 1000 ft. and Washington monument as 550 ft. high. On squared paper draw a vertical line 20 spaces long to represent the Eiffel tower. How many spaces long must a line be to represent the Washington monument? Draw this line by the side of the other.

21. Work Exs. 1–11 of this section as sight work.

§ 97. Long Division by 11 and 12

1. Review the multiplication tables for 11 and 12.

2. Divide 352 by 11.

WRITTEN WORK

$$\begin{array}{r l} \left.\begin{array}{r}2\\ \underline{30}\end{array}\right\} & \text{or } 32 \ \textit{Quotient}\\ 11\overline{)352} & \\ \underline{330} & (= 30 \times 11)\\ 22 & \\ \underline{22} & (= 2 \times 11)\end{array}$$

SHORTER FORM OF WORK

$$\begin{array}{r l} 32 & \textit{Quotient}\\ 11\overline{)352} & \\ \underline{33} & \\ 22 & \\ \underline{22} & \end{array}$$

EXPLANATION

11 is contained in 35 tens, 3 tens times (write 3 over 5, *i.e.* in the tens' column), with a remainder of 2 tens. 2 tens + 2 ones = 22 ones. 11 is contained in 22 ones 2 times (write 2 in the units' place of the quotient).

3. The above process is called **long division.** Long division is difficult to the pupil who gets confused in the five steps which must be used. It will be helpful therefore for the pupil to commit to memory the following:

The Five Steps in Long Division:

1. Divide . . . (see, in Ex. 2, 35 ÷ 11).
2. Write . . . (see 3 in quotient).
3. Multiply . . (see $11 \times 3 = 33$).
4. Subtract . . (see $35 - 33$).
5. Bring down . (see 2 placed to the right of 2).

To the Teacher. The divisors 11 and 12 are used in first teaching long division so as to utilize the pupil's knowledge of the 11 and 12 tables. As a rule, division by 11 and 12 is best performed as short division.

4. Divide:

(*1*) 253 by 11
(*2*) 384 by 12
(*3*) 451 by 11
(*4*) 888 by 12
(*5*) 756 by 12
(*6*) 297 by 11
(*7*) 1008 by 12
(*8*) 1023 by 11
(*9*) 3542 by 11
(*10*) 2592 by 12
(*11*) 1353 by 11
(*12*) 2592 by 12
(*13*) 7632 by 12
(*14*) 2277 by 11
(*15*) 3096 by 12

5. If 12 coats cost $ 156, what is the price of 1 coat?

6. If 11 acres of ground yield 253 bushels of wheat, what is the average yield per acre?

7. If I pay $ 264 rent for my house for a year, what do I pay per month?

8. If 12 wagons cost $ 2436, what is the price of 1 wagon?

9. If 11 acres of land yield 2553 bushels of potatoes, how many bushels does 1 acre yield on the average?

10. Make up, and solve, an example concerning 11 acres of ground which cost $ 3375, and the price per acre.

11. Repeat the tables for liquid measure and linear measure.

12. Work again the examples in § 76 (p. 193).

§ 98. Division by Small 2-Figured Numbers

To the Teacher. If the teacher prefers, § 99 may be taught before § 98.

1. Divide 63 by 21.

We first estimate how many times 2 tens is contained in 6 tens. We then multiply 21 by the figure taken and observe whether the product is 63.

Thus, $\frac{6 \text{ tens}}{2 \text{ tens}} = 3$. Then, since $21 \times 3 = 63$, we have $\frac{63}{21} = 3$.

2. $\frac{84}{21} = ?$ $\quad \begin{array}{r} 22\overline{)88} \\ ? \end{array} \quad \begin{array}{r} 23\overline{)69} \\ ? \end{array} \quad \begin{array}{r} 24\overline{)72} \\ ? \end{array} \quad \begin{array}{r} 26\overline{)78} \\ ? \end{array}$

3. $\frac{630}{21} = \frac{63 \text{ tens}}{21} = 3 \text{ tens} = 30.$

$$\begin{array}{r} 21\overline{)840} \\ ? \end{array} \quad \begin{array}{r} 22\overline{)880} \\ ? \end{array} \quad \begin{array}{r} 23\overline{)690} \\ ? \end{array} \quad \begin{array}{r} 24\overline{)720} \\ ? \end{array} \quad \begin{array}{r} 26\overline{)780} \\ ? \end{array}$$

4. $\frac{65 \text{ tens}}{21} = 3 \text{ tens (and 2 tens over)}$. Hence, $\begin{array}{r} 21\overline{)650} \\ 30\frac{20}{21} \end{array}$ *Quotient*

$$\begin{array}{r} 21\overline{)64} \text{ tens} \\ ? \end{array} \quad \begin{array}{r} 21\overline{)640} \\ ? \end{array} \quad \begin{array}{r} 31\overline{)630} \\ ? \end{array} \quad \begin{array}{r} 42\overline{)1270} \\ ? \end{array} \quad \begin{array}{r} 51\overline{)1040} \\ ? \end{array}$$

5. $\frac{6300}{21} = \frac{63}{21}$ hundreds = 3 hundreds = 300 *Quotient.* **Hence,**

$$\begin{array}{rl} 21)\underline{6300} & \\ 300 & \textit{Quotient} \end{array}$$

$$\begin{array}{cccc} 22)\underline{8800} & 23)\underline{6900} & 24)\underline{7200} & 26)\underline{7800} \\ ? & ? & ? & ? \end{array}$$

6. Give the quotient for each of the following:

$$31)\underline{620} \qquad 31)\underline{9300} \qquad 41)\underline{8200} \qquad 41)\underline{16400} \qquad 42)\underline{8400}$$

7. Divide 6846 by 21.

WRITTEN WORK

$$\begin{array}{rrl} & 326 & \textit{Quotient} \\ \textit{Divisor}\ 21) & \overline{6846} & \textit{Dividend} \\ & \underline{6300} & \\ & 54 & \\ & \underline{42} & \\ & 126 & \\ & \underline{126} & \end{array}$$

SHORTER FORM OF WORK

$$\begin{array}{rr} & 326 \\ 21) & \overline{6846} \\ & \underline{63} \\ & 54 \\ & \underline{42} \\ & 126 \\ & \underline{126} \end{array}$$

EXPLANATION

21 is contained in 68 hundreds, 3 hundreds times, with a remainder of 5 hundreds (write 3 over 8, *i.e.* in the hundreds' column).

5 hundreds + 4 tens = 50 tens + 4 tens = 54 tens.

21 is contained in 54 tens, 2 tens times, with 12 tens over (write 2 in tens' space of quotient).

12 tens + 6 units = 126 units.

21 is contained in 126 units, 6 units times (which write in the units' place of the quotient).

In the shorter form of work, notice the saving of labor by the omission of zeros.

8. Point out the five steps of long division as used the first time in Ex. 7. Also as used the second time.

9. Divide:

(*1*) 8883 by 21
(*2*) 6880 by 32
(*3*) 4746 by 42
(*4*) 6944 by 32
(*5*) 6541 by 31
(*6*) 4876 by 22
(*7*) 6996 by 22
(*8*) 9966 by 33
(*9*) 8528 by 41

10. Divide 13,536 by 32.

Written Work

$$\begin{array}{r l}
423 & \textit{Quotient} \\
32\overline{)13536} & \\
\underline{128} & \\
73 & \\
\underline{64} & \\
96 & \\
\underline{96} &
\end{array}$$

Explanation

If the divisor is not contained in the first two figures of the dividend, the divisor must be divided into the first 3 figures of the dividend. Thus, 32 is contained in 135 hundreds, 4 hundreds times, with a remainder of 7 hundreds. Let the pupil complete the explanation.

11. Divide:

(*1*) 5166 by 42
(*2*) 10,144 by 32
(*3*) 1435 by 41
(*4*) 22,188 by 43
(*5*) 9827 by 31
(*6*) 28,386 by 83
(*7*) 7747 by 61
(*8*) 46,228 by 91
(*9*) 92,708 by 43

12. If 22 acres of ground yield 504 bushels of wheat, what is the average yield per acre?

13. If one bushel (or 32 quarts) of cranberries costs $ 4.16, what is the price of one quart?

14. If an automobile travels 21 miles an hour, how many hours will it take to go 252 miles?

15. If 21 beeves weigh 12,852 pounds, what is the average weight of the beeves?

16. If the salary of the President of the United States is $ 75,000 a year, how much is it a month?

17. There are 52 weeks in a year. If the salary of a cabinet officer is $ 12,000 a year, what is it per week?

18. An automobile runs from New York to San Francisco in 42 days. What is the average daily run?

19. If a rectangle is 41 in. wide and contains 2747 sq. in., how long is it?

20. How long is a rectangle which is 43 yd. wide and contains 18,189 sq. yd.?

Work the following examples at sight:

21. Divide:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)
21)420	32)640	41)1230	62)1240	22)880

22. At $ 31 a head, how many cattle can be bought for $ 620? For $ 1240? For $ 1860?

23. How many cattle, at $ 20 a head, could be bought for the sums in Ex. 22?

24. At $ 22 a month, how many months' house rent will $ 88 pay? $ 880? $ 660? $ 1760? $ 8866?

§ 99. Division by a 2-Figured Number in which the Second Figure is Large in Comparison with the First Figure

1. Let the pupil compute a table showing the products of 13 for all multipliers from 2 to 9. Also a similar table for 14; one for 16, etc., up to 19. Then let each pupil write these tables on a card.

Thus:

1 × 13 = 13	1 × 14 = 14		1 × 19 = 19
2 × 13 = 26	2 × 14 = 28	and so on,	2 × 19 = 38
3 × 13 = 39	3 × 14 = 42	up to	3 × 19 = 57
etc., to	etc., to		etc., to
9 × 13 = 117	9 × 14 = 126		9 × 19 = 171

2. By use of the card containing this set of tables, divide 752 by 16.

Written Work

$$\begin{array}{r l} 47 & \textit{Quotient} \\ 16\overline{)752} & \\ \underline{64} & \\ 112 & \\ \underline{112} & \end{array}$$

Explanation

To find how many times 16 is contained in 75, we examine the table of 16's on our card, and find the number in the list of products which is next less than 75, viz.: 64. Since 4 × 16 = 64, 16 is contained in 75, 4 times, with a remainder of 11. Other divisions are performed in like manner.

3. Point out the five steps of long division as used the first time in the above example. Also as used the second time.

4. By use of the cards made in Ex. 1, divide:

(*1*) 432 by 16
(*2*) 493 by 17
(*3*) 589 by 19
(*4*) 405 by 15
(*5*) 468 by 18
(*6*) 544 by 17
(*7*) 496 by 16
(*8*) 480 by 15
(*9*) 570 by 19
(*10*) 675 by 15
(*11*) 646 by 17
(*12*) 612 by 18

5. If an automobile travels 481 miles in 13 hours, how far does it go in 1 hour?

6. If 14 cows cost $952, what is the average price per cow?

7. If 16 hogs weigh 4112 pounds, what is the average weight?

8. If a rectangle contains 1368 sq. in. and is 18 in. wide, how long is the rectangle?

9. Work Exs. 4–8 without the use of your card of multiplication tables made in Ex. 1.

10. On a card write a set of tables showing the products of 23, 24, etc., to 29, similar to those made in Ex. 1.

11. By the use of the card, divide:

(*1*) 936 by 26
(*2*) 945 by 27
(*3*) 957 by 29
(*4*) 850 by 25
(*5*) 896 by 28
(*6*) 1675 by 25
(*7*) 1917 by 27
(*8*) 2132 by 26
(*9*) 1885 by 29
(*10*) 2324 by 28
(*11*) 2225 by 25
(*12*) 2511 by 27

12. If a fast steamer goes 26 miles in 1 hour, how many hours will it take to go 1170 miles? 1722 miles?

13. If 27 acres of land cost $2376, what will 1 acre cost?

14. If 27 sheep cost $112.05, what is the price of 1 sheep?

15. Work Exs. 11–14 without the use of the card of tables.

The construction and use of cards of tables may be continued or not, at the option of the teacher, in connection with the following examples in long division; but the cards should never be used after the process of long division in such cases is mastered.

16. Divide:

(*1*) 7092 by 59
(*2*) 28,124 by 68
(*3*) 96,755 by 37
(*4*) 8709 by 87
(*5*) 7011 by 57
(*6*) 22,839 by 69
(*7*) 20,976 by 76
(*8*) 16,575 by 65
(*9*) 15,618 by 38
(*10*) 14,064 by 48
(*11*) 20,837 by 67
(*12*) 24,336 by 39

17. If 39 acres of land cost $ 3654, what is the price of 1 acre?

18. How many beeves, at $ 35 each, can a dealer buy with $ 2380? With $ 6580?

19. If 46 horses cost $ 6842, what is the price of 1 horse?

20. At the rate of 45 miles an hour, how long will it take an aeroplane to travel 495 miles?

21. Make up an example in long division concerning 67 acres of land which cost some probable sum of money.

22. Work at sight:

$16\overline{)320}$ $27\overline{)810}$ $1300 \div 65$ $\frac{3434}{17}$ $\frac{14028}{28}$

23. Work at sight as many examples in § 74 (p. 185) as you can.

To the Teacher. See Note 31 concerning Beating One's Record (p. 360).

§ 100. Measuring Solids; Volume

1. Put blocks together until you have a solid 3 in. long, 3 in. wide, and 3 in. high.

2. Make another similar solid which is 4 in. each way. Another 5 in. each way.

The surface which "bounds" a solid is the outside surface of the solid.

Definitions

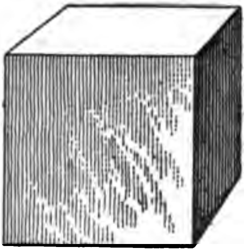
A **cube** is a solid bounded by six equal squares.

A **cubic inch** is a cube bounded by six square inches.

3. What is a cubic foot? A cubic yard?

4. Put blocks together to make a solid 5 in. long, 3 in. wide, and 2 in. high.

5. How many layers of blocks are there in the solid in Ex. 4? How many blocks in each layer? How many cubic inches in the solid?



A CUBIC INCH

6. Which is the shorter way to find the number of blocks in the solid: to count them, or to multiply 5 × 3 × 2?

7. Form another solid 5 in. long, 4 in. wide, and 3 in. high. Find the number of cubic inches in this solid in the shortest way.

8. What do you mean by the *dimensions* of a solid?

9. Write each of the following dimensions in two shorter ways:

(*1*) 6 inches long, 5 inches wide, 4 inches high.
(*2*) 7 inches long, 4 inches wide, 3 inches high.
(*3*) 1 foot long, 6 inches wide, 2 inches high.

10. Find the number of cubic inches in each of the solids described in Ex. 9.

Definition

The **volume** of a solid is the number of cubic inches (or other like cubic units) which the solid contains.

11. Find the volume of the solids in Exs. 4, 7, and 9.

12. Here is a box 6 in. long, 5 in. wide, and 4 in. deep on the inside. Which is the shorter way to find its volume: to fill the box with blocks and count their number, or to measure the inside edges of the box and multiply?

Definitions

A **cubic foot** is a cube each of whose edges is one foot.

A **cubic yard** is a cube each of whose edges is one yard.

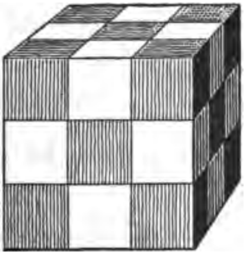


DIAGRAM REPRESENTING A CUBIC YARD (1 space = 1 ft.)

13. How many cubic feet in a solid 9 ft. long, 6 ft. wide, and 4 ft. high? (How many cubic feet in each layer? How many layers?)

14. How many cubic feet in a cellar 12 ft. long, 9 ft. wide, and 4 ft. deep? What will it cost to dig this cellar at 2 cents a cubic foot?

15. How many cubic feet in a cubic yard?

Measures

27 cubic feet = 1 cubic yard.

This may be shortened to 27 cu. ft. = 1 cu. yd.

16. How many cubic yards in a cellar 7 yards long, 5 yards wide, and 2 yards deep? What will it cost to remove the dirt from this cellar at 20¢ a cubic yard?

17. How many cubic feet of water in a tank 8 ft. long, 7 ft. wide, and 5 ft. deep?

18. How many cubic inches in a brick 8 in. long, 4 in. wide, and 2 in. thick?

19. If 1 cubic foot of marble costs 32 cents, what will a cubic yard cost, at the same rate?

20. What will $\frac{1}{3}$ of a cubic yard cost? $\frac{2}{3}$?

To the Teacher. See Note 38 concerning Original Problems (p. 362).

§ 101. Review

1. Add:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)
3625	498	$10.12	$12.74	$83.75
4897	7246	37.42	5.93	5.11
3215	3492	93.61	111.23	159.90
409	8972	51.74	54.87	23.76
2762	476	1.08	897.09	5.48
1003	2181	76.23	54.37	100.72

2. Subtract:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)
$329.42	$56.90	$240.00	$300.00	$1000.00
103.21	37.29	109.82	209.16	392.78

3. Multiply each of the following by 3:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)
7241	8976	$20.16	$75.94	$892.78

Also by 5, 9, 6, 8, 7.

4. Divide each of the following by 5, noting both quotient and remainder:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)	(*6*)
3764	8299	70,643	$21.72	$211.37	$937.06

Also by 6, 7, 8, 9.

5. Multiply each of the following by 27:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)	(*6*)
212	315	608	1027	$2.73	$12.05

Also by 33, 46, 71, 89, 95, 74.

6. Divide each of the following by 11, noting both quotient and remainder:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)	(*6*)
2872	8964	5194	27,246	89,746	$973.84

Also by 14, 27, 19, 46, 85, 77, 67, 94.

7. Compute:

(*1*) 816 × 28

(*2*) 9289 ÷ 72

(*3*) 1274 × 83

(*4*) 92,073 ÷ 64

(*5*) $37.84 × 65

(*6*) $551.32 ÷ 38

(*7*) $21.76 × 46

(*8*) $1087.11 ÷ 47

(*9*) 3738 × 67

8. Make the largest number you can with the figures, 3, 2, 7, 1, 8.

9. Tell how much is

$\frac{1}{2}+\frac{1}{4}$ $\quad \frac{1}{4}-\frac{1}{8}$ $\quad \frac{1}{12}+\frac{1}{4}$

$\frac{1}{2}-\frac{1}{4}$ $\quad \frac{1}{2}-\frac{1}{3}$ $\quad \frac{1}{5}+\frac{1}{10}$

$1-\frac{1}{8}$ $\quad \frac{1}{2}+\frac{1}{3}$ $\quad \frac{1}{3}+\frac{1}{9}$

10. If 27 tons of hay cost $351, what is the price of 1 ton? Of 12 tons? Of 63 tons? Of 97 tons?

11. If 16 blocks in a certain city make one mile, how many rods long is 1 block? How many feet long is 1 block? How many yards?

12. A baseball has been thrown a distance of 426 ft. How long will it take a boy to run this distance, if he can run 17 feet in one second?

13. If an aëroplane goes 42 miles in 1 hour, how far will it go in 9 hours at the same rate? How far in 19 hours?

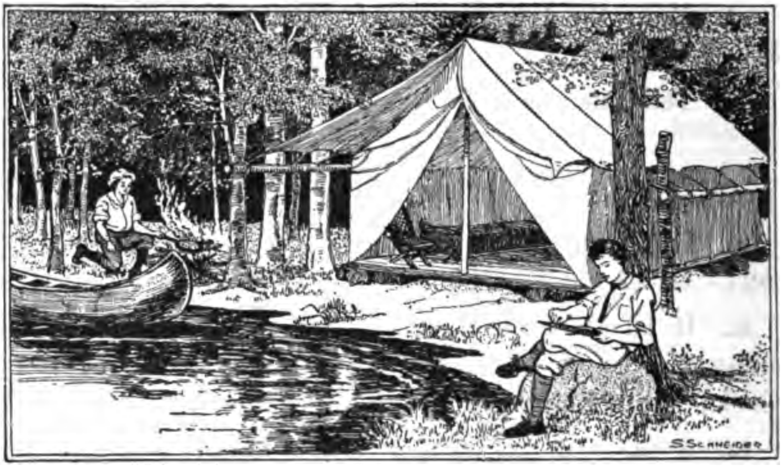
14. If 1 cubic foot of water weighs 62 pounds, what will be the weight of 25 cubic feet of water?

15. How many cubic feet of water will weigh 1 ton?

16. How many cubic feet of water will weigh $2\frac{1}{2}$ tons?

17. How many examples in § 57 can you work at sight? In § 75? In § 77?

To the Teacher. This drill may be continued according to the needs of the class.



§ 102. Review; Camping Out

1. Leo went camping for a week with three of his friends. His railroad fare to the camp and back was $ 4.75. He spent $ 3.60 for a fishing rod, line, and hooks. He spent 40 cents for a small hatchet. How much did all these cost him?

2. The party rented a tent for $ 4, a canoe for $ 3, and spent $ 8 for provisions. What was Leo's share of this expense, if the boys paid equal amounts? What was Leo's entire expense? His expense per day?

3. Leo caught, on successive days, the following numbers of fish: 13, 21, 11, 14, 5, 8. How many fish did he catch in all? What was his average catch per day?

4. One day Leo got up at 4.30 in the morning, and went to bed at 7.45 in the evening. How many hours was he awake?

5. On successive days the party went in the canoe the following number of miles: 20, 32, 4, 8, 23, 9. What was the average number of miles per day?

6. If $\frac{1}{4}$ inch in the picture (p. 260) represents 2 ft., how high is the tent? How wide at the bottom?

7. If the canvas in the tent equals a rectangle 9 ft. × 24 ft., how many square feet of canvas are there in the whole tent? How many square yards?

8. What would it cost to have the tent made at 9¢ a square foot?

9. If the boys should have a tent made at the price given in Ex. 8, and should use the tent in camping one week each year (instead of renting one at $4), in how many years would their tent pay for itself?

10. What would 41 square yards of canvas cost at 63 cents a square yard?

11. The boys kept live minnows (for bait) in a box which measured 18 in. × 10 in. × 8 in. on the inside; how many cubic inches in the box? If they should double the length and width of the box (that is, the 18 in. and 10 in.), what would the volume of the box then be?

12. If 11 boys on their vacation spent $137.50 in all, what was the average amount spent by each boy?

13. Make up some examples of your own concerning camping out.

CHAPTER VI

NUMBERS THROUGH MILLIONS (*Continued*); MULTIPLICATION AND DIVISION BY 3-FIGURED NUMBERS; OPERATIONS WITH FRACTIONS

§ 103. Multiplication by 3-Figured Numbers

1. Multiply 546 by 372.

	WORK IN FULL	SHORTER FORM OF WORK
Multiplicand	546	546
Multiplier	372	372
1st Partial Product	1092 (=546 × 2)	1092
2d Partial Product	38220 (=546 × 70)	3822
3d Partial Product	163800 (=546 × 300)	1638
Entire Product	203112	203112 *Product*

Multiply:

2. 416 by 324

3. 476 by 123

4. 1214 by 415

5. 389 by 125

6. 2105 by 328

7. 3270 by 623

8. 1074 by 729

9. 2089 by 312

10. 4287 by 698

11. If the price of 1 acre is $ 123, what will be the cost of a farm containing 132 acres?

12. What will 216 horses cost at $ 175 per horse?

13. A man's salary is $ 225 a month. What will be the amount of his salary for 216 months?

14. There are 365 days in 1 year. How many days will there be in 417 years (not allowing for leap years)?

15. Multiply 672 by 403.

Written Work

672
403
2016
2688
270816 *Product*

Explanation

Since there is a zero in the tens' place of the multiplier, the product for that place is zero and is left vacant. Hence, when multiplying by 4, we set down 8, the first figure of the partial product, in the hundreds' place and proceed as usual

Multiply:

16. 816 by 403. **17.** 942 by 506. **18.** 1042 by 805.

19. Multiply 758 by 420.

Since 420 = 42 × 10, multiply first by 42 and then by 10, thus:

758
420
1516
3032
318360 *Product*

Multiply:

20. 748 by 360. **21.** 1272 by 590. **22.** 879 by 650.

23. If it costs $ 2785 to make 1 mile of road, what will it cost to make 216 miles? 308 miles? 430 miles?

24. If 1 acre of land costs $ 172, what will be the cost of 108 acres? Of 209 acres? Of 220 acres?

25. Make up, and solve, an example concerning the cost of 207 horses.

26. Drill on multiplication by 2-figured and 3-figured multipliers by drawing from a box cards on which examples are written or printed.

§ 104. Division by 3-Figured Divisors

1. Divide 17,472 by 312.

WRITTEN WORK

```
      56
312)17472
    1560
     1872
     1872
```

EXPLANATION

312 is contained in 1747 (tens), 5 (tens) times with 187 (tens) as a remainder. Hence the figure 5 is to be set down in the tens' place of the quotient.

187 tens + 2 ones = 1872 ones.

312 is contained in 1872 (ones) 6 times. Set down 6 in the units' place of the quotient.

Divide:

2. 4452 by 102
3. 11,890 by 205
4. 25,232 by 304
5. 245,548 by 391
6. 62,543 by 587
7. 854,321 by 796
8. 246,447 by 417
9. 87,979 by 907
10. 802,392 by 998
11. 51,689 by 127
12. 166,952 by 328
13. 472,131 by 627
14. 357,738 by 547
15. 7915 by 853
16. 204,688 by 336
17. 91,008 by 384

18. 10,000 days make how many years and how many days left over (not allowing for leap years)?

19. There are 144 square inches in 1 square foot. 44,928 square inches make how many square feet?

20. If 1 share of railroad stock costs $117, how many shares may be purchased for $84,336?

21. If a locomotive runs 744 miles in 1 day, how many days will it take to run 10,000 miles, at the same rate?

22. Review multiplication and division by 3-figured numbers, by working on the blackboard examples which you find on cards drawn from a box.

To the Teacher. See Note 29 concerning Card Drills (p. 359).

23. Work at sight Exs. 20–23 on page 202.

§ 105. Definition, Rule, and Formula for Volume

1. What is a cubic inch? A cubic foot? Draw a diagram of a cubic solid, each edge of which contains 12 spaces. How many cubic units will one layer of this solid contain? How many layers does it contain?

12 × 144 cubic inches = ?

2. How many cubic inches in a cubic foot?

Measures

1728 cubic inches = 1 cubic foot.

This may be shortened to 1728 cu. in. = 1 cu. ft.

3. How many cubic inches in $\frac{1}{3}$ of a cubic foot? In $\frac{1}{2}$? In $\frac{1}{4}$? In $\frac{3}{4}$? In 2 cubic feet? In 5 cubic feet? In 14?

Definition

The **volume** of a solid is the number of cubic units (as cubic inches or cubic feet) which the given solid contains.

4. Which is shorter to say: "number of cubic feet," or "volume"? Which is shorter to write?

5. Find the volume of a box 4 ft. long, 2 ft. wide, and 6 in. deep. Find this volume (1) in cu. ft.; (2) in cu. in.

Rule for Volume

The volume of a box-shaped solid = (1 cubic unit) × (number of units in length) × (number of units in width) × (number of units in height).

If the volume is found in cubic inches, the length, breadth, and height must all be taken in inches; if the volume is found in cubic feet, all dimensions must be in feet. That is, *in finding a volume the dimensions must be in terms of like units.*

If we abbreviate by letting *V cu. units* stand for volume, and l, w, h stand for number of like units in length, width, and height, we have the following formula for finding the volume of a box-shaped (or rectangular) solid:

Formula

$$\mathbf{V\ cu.\ units = (1\ cu.\ unit) \times l \times w \times h.}$$

For further brevity, this is sometimes written in the abstract form:

$$\mathbf{V = l \times w \times h.}$$

6. Find the volume (first in cubic yards, then in cubic feet) of a tank 9 yd. long, 4 yd. wide, and 6 ft. deep. Point out the value of l, w, h in this example. Draw a diagram of the solid.

7. Here is a box 6 in. long (on the inside), 4 in. wide, and 5 in. deep. Fill the box with inch blocks. Count the inch blocks you have used. What shorter way is there of finding how many inch blocks the box will hold?

8. Find the volume in each of the following examples, pointing out the value of *l*, *w*, *h*, in each case:

	LENGTH	WIDTH	HEIGHT		LENGTH	WIDTH	HEIGHT
(*1*)	108 ft.	7 ft.	5 ft.	(*4*)	2 yd.	2 ft.	3 ft.
(*2*)	27 ft.	3 yd.	6 ft.	(*5*)	2 yd.	6 ft.	6 in.
(*3*)	8 ft.	4 ft.	9 in.	(*6*)	1 yd.	2 yd.	18 in.

9. What is the area of a rectangle?

10. What is the rule for finding the area of a rectangle? Into what formula may this rule be abbreviated?

11. Find the area of a garden 68 yd. long and 21 yd. wide. How long is the perimeter of this garden?

If it costs 60 cents a yard to put a fence around the garden, what will the fence cost?

12. Work at sight Exs. 3–10 on page 205.

§ 106. General Review

At sight, answer the following:

1. Add:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)
34 ¢	38 ¢	38 ¢	62 lb.	$ 2.27
12 ¢	12 ¢	15 ¢	9 lb.	$ 1.02

2. Subtract:

(*1*)	(*2*)	(*3*)	(*4*)	(*5*)
86 ¢	$ 92	$ 2.00	$ 3.16	124
53 ¢	$ 17	$ 1.25	$ 1.94	99

3. Give the product for each of the following:

(*1*) $ 22 × 3
(*2*) $ 47 × 2
(*3*) $ 16 × 5
(*4*) 105 × 3
(*5*) 210 × 2
(*6*) 316 × 2
(*7*) 103 × 6
(*8*) 207 × 2
(*9*) 510 × 4

4. Give the quotient of the following:

(*1*) $ 42 ÷ 2
(*2*) $ 42 ÷ 3
(*3*) 24 ft. ÷ 4
(*4*) 114 ÷ 3
(*5*) 672 ÷ 6
(*6*) 816 ÷ 8
(*7*) 120 ÷ 12
(*8*) 990 ÷ 9
(*9*) 620 ÷ 5

5. Multiply each of the following by 2:

32; 64 ft.; $ 105; 208; 3100; 67; 119.

Also multiply each by 3. By 4. By 6. By 7.

6. Divide each of the following by 2, giving the remainder where there is any:

62 ¢; 87 ft.; 124; 336; 519; 724.

Also divide each by 3. By 4. By 5. By 6.

7. If three pencils cost 10 ¢, what will be the cost of 6 pencils? Of 9 pencils? Of 12 pencils?

8. If two quarts of raspberries can be bought for 25 ¢, how many quarts can be bought for 50 ¢? For 75 ¢? For $ 1?

9. State how many $\frac{1}{4}$'s are in $\frac{1}{2}$. In 1.

10. How many $\frac{1}{8}$'s in $\frac{1}{4}$? In $\frac{1}{2}$? In $\frac{3}{4}$? In 1?

11. Give the sum for each of the following:

(*1*) $\frac{1}{2}+\frac{1}{2}$
(*2*) $\frac{1}{4}+\frac{1}{4}$
(*3*) $\frac{1}{2}+\frac{1}{4}$
(*4*) $\frac{1}{2}+\frac{1}{8}$

12. Give the difference for each of the following:

(*1*) $\frac{3}{4}-\frac{1}{4}$
(*2*) $\frac{1}{2}-\frac{1}{4}$
(*3*) $\frac{1}{2}-\frac{1}{8}$
(*4*) $\frac{3}{8}-\frac{1}{4}$

13. Write the following on the blackboard: As the teacher points at each of the numbers, make change for 25 ¢. For 50 ¢.

12 ¢	23 ¢
18 ¢	9 ¢
11 ¢	19 ¢

14. How many hours is it from 10 o'clock in the morning to 2 o'clock in the afternoon? From 9 o'clock in the morning to 5 o'clock in the afternoon?

15. Tell how many ounces there are in 2 lb. In 5 lb. In ½ lb. In ¾ lb. In ⅛ lb.

16. Tell how many quarts there are in 1 bushel. In ½ bu. In 2 bu. In ⅛ bu. In ¼ bu. In 3 bu.

17. Tell how many square inches there are in the area of each of the following rectangles:

	LENGTH	WIDTH		LENGTH	WIDTH
(*1*)	9 in.	4 in.	(*4*)	14 in.	7 in.
(*2*)	8 in.	7 in.	(*5*)	1 ft.	3 in.
(*3*)	16 in.	8 in.	(*6*)	2 ft.	2 in.

18. Tell how many cubic inches there are in the volume of each of the following:

	LENGTH	WIDTH	HEIGHT
(*1*)	6 in.	5 in.	4 in.
(*2*)	1 ft.	5 in.	3 in.
(*3*)	½ ft.	¼ ft.	2 in.
(*4*)	10 in.	¾ ft.	5 in.

19. Give the value of each of the following:

(*1*) $32 \div 4$
(*2*) 18×5
(*3*) $37 - 9$
(*4*) $62 + 16$
(*5*) 105×3
(*6*) $\frac{3}{4} - \frac{1}{4}$
(*7*) $105 \div 5$
(*8*) $\frac{3}{8} + \frac{1}{8}$
(*9*) $105 + 16$
(*10*) 1 ft. − 3 in.
(*11*) $105 - 16$
(*12*) 1 bu. − 1 pk.

§ 107. Combinations of Operations; Shortening the Work

1. 19 times 256 and 12 times 256 are how many times 256 in all? Compute 19 × 256. Also 12 × 256. Add the two products.

Now multiply 256 by 31. Which way of getting the final result, 7936, is easier?

2. Compute 18 × 1024 plus 23 × 1024 in the shortest way.

3. 46 times 256 less 25 times 256 are how many times 256? Compute 46 × 256. Also 25 × 256. Take the difference of the two products.

Now multiply 21 by 256. Which way of getting the final result, 5376, is easier?

4. Compute in the easiest way 827 × 64 less 827 × 41.

5. 1922 ÷ 31 less 1736 ÷ 31 is how many ÷ 31? Compute 1922 ÷ 31. Now compute 1736 ÷ 31. Take the difference of the quotients.

Now divide 186 by 31. Which is the easiest way of getting the final result, 6?

6. A field containing 31 acres yielded 1736 bushels of corn one year and 1922 bushels the next. How many more bushels did it produce the second year? What was the gain per acre?

7. A field of 52 acres produced —— bushels of corn one year. With better cultivation the next year it produced —— bushels. What was the gain in bushels per acre? Fill in the blank spaces with probable numbers, and compute.

8. Compute in the shortest way $18 \times \$21.06$ less $12 \times \$21.06$.

9. Also compute $2133 \div 9$ less $1953 \div 9$.

10. Add (and make note of the time it takes you to do the addition correctly):

(1)	(2)	(3)	(4)	(5)
1231	6872	$32.13	$607.58	$25.73
3857	2857	35.62	124.73	38.65
2100	8576	100.05	105.72	21.01
4675	2001	45.72	765.43	111.15
7428	2573	42.07	520.75	52.13
4326	3687	32.08	100.00	12.02
1001	8752	1.20	754.32	200.05

11. Find the value of $8 \times 9 + 5 \times 3$.

In a series of numbers connected only by the signs +, −, ×, ÷, it is customary to perform the multiplications and divisions before the additions and subtractions, unless there is some special reason for changing this order.

$$\begin{aligned} \text{Hence, } 8 \times 9 + 5 \times 3 &= 72 + 15 \\ &= 87. \end{aligned}$$

12. Compute $8 \times 9 + 6 \div 3$.

In accordance with the statement in Ex. **11**,

$$8 \times 9 + 6 \div 3 = 72 + 2 = 74.$$

Find the value of each of the following:

13. $7 \times 8 + 12 \div 4$

14. $102 \times 17 - 51 \times 3$

15. $316 \div 4 + 8 \times 24$

16. $519 \times 11 - 216 \times 8$

17. $1000 \div 20 + 12 \div 3$

18. $3160 \div 40 + 215 \times 12$

19. Subtract (making note of the time required):

(1)	(2)	(3)	(4)	(5)
\$678.56	\$612.75	\$942.78	\$705.32	\$1000.00
345.12	412.31	625.73	258.24	924.06

20. Add at sight:

(1)	(2)	(3)	(4)	(5)	(6)
37	42	67	75¢	\$21.42	\$42.17
21	25	23	46	10.23	31.23

Subtract the same at sight.

21. Compute at sight:

(1) $7 \times 12¢ + 3 \times 12¢$

(2) $4 \times 12¢ + 2 \times 12¢$

(3) $17 \times 23¢ - 15 \times 23¢$

(4) $40 \times 25¢ - 30 \times 25¢$

(5) $17 \times 27¢ + 13 \times 27¢$

(6) $17 \times 27¢ - 13 \times 27¢$

22. Let the teacher or pupil put on the blackboard other similar examples to be worked at sight.

§ 108. Analysis; Comparison; Cancellation

1. If 21 acres of land yield 462 bushels of wheat, what will 1 acre yield? What will 32 acres yield?

2. If 21 acres of land produce 862 bushels of corn, how many bushels will 25 acres produce?

3. If 24 acres of land cost \$5928, what will 40 acres cost at the same price?

4. If a railroad train goes 29,725 miles in 41 days, how far will it go in 85 days at the same rate?

5. If an automobile traveled —— miles in —— hours, how far would it go in —— hours? Fill in the blank spaces with probable numbers, and work the example.

6. Make up an example entirely your own, similar to Ex. 5.

7. If 12 oranges cost 25¢, what will 36 oranges cost? Compare 12 and 36; that is, how many times 12 is 36?

8. If 6 car tickets cost a quarter, what will a teacher have to pay if she takes 42 children to the park and back, paying one fare each way?

9. We have 35 apple trees in our orchard. We have gathered 11 bushels from 5 trees. How many bushels will all the trees produce at the same rate?

10. If 100 oysters cost 60¢, what will 50 oysters cost? 75 oysters?

11. 356 barrels of cranberries are gathered from 5 acres. How many barrels should 10 acres yield? 20 acres?

12. If 6 oranges cost 15¢, what will 4 oranges cost?

We save labor by indicating the work thus:

$$\text{Cost of 6 oranges} = 15\text{¢}.$$

$$\text{Cost of 1 orange} = \frac{15\text{¢}}{6}.$$

$$\text{Cost of 4 oranges} = \frac{15\text{¢} \times 4}{6} = \frac{15\text{¢} \times 2}{3}\left(\text{since } \frac{4}{6} = \frac{2}{3}\right) = \frac{30\text{¢}}{3} = 10\text{¢}.$$

The process of thus changing $\frac{4}{6}$ into $\frac{2}{3}$ is called **cancellation.**

The above process is usually written thus:

$$\frac{\overset{5}{\cancel{15}} \times \overset{2}{\cancel{4}}}{\underset{\cancel{3}}{\cancel{6}}} \text{ cents} = 10 \text{ cents.}$$

13. If 8 oranges cost 20 cents, what will 6 oranges cost? (Shorten the work by the use of cancellation.)

14. If 10 pencils cost 25 cents, what will 12 pencils cost?

15. If 6 baseballs cost $8, what will 9 baseballs cost?

16. If 15 oranges cost 40¢, what will 9 oranges cost? What will 24 oranges cost?

17. How many pounds in 8 barrels of flour, if 1 barrel contains 196 pounds? If a family uses 4 pounds a day, how many days will 8 barrels last?

Is it easier to find the total number of pounds in 8 barrels and divide by 4, or to find the number of times 4 lb. is contained in 196 lb. and multiply the result by 8? Write $\frac{8 \times 196}{4}$, and try each of these methods.

18. Compute in the shortest way:

(*1*) $\frac{8 \times 256}{4}$ (*2*) $\frac{9 \times 256}{12}$ (*3*) $\frac{912 \times 25}{5}$

(*4*) $\frac{17 \times 320}{16}$ (*5*) $\frac{18 \times 242}{12}$ (*6*) $\frac{5 \times \$13.11}{15}$

§ 109. Fractions: Reduction, Addition, and Subtraction of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$

1. How many quarters in a dollar? In a half-dollar?

Definition

A **fraction** is one or more of the equal parts into which a unit, or a group of units, is divided.

2. What short way is there of writing three fourths?

> *Definitions and Principle*
>
> The **numerator** of a fraction is the number above the line in the fraction.
>
> The **denominator** is the number below the line in the fraction.
>
> The denominator tells the number of equal parts into which the unit is divided. The numerator tells how many of these parts are taken.

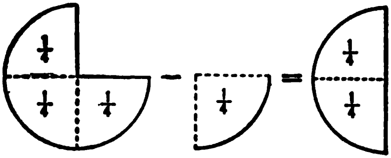
3. In $\frac{\$7}{10}$, into how many equal parts is \$7 divided? How many of these are taken? Tell the same for $\frac{\$9}{10}$. For $\frac{\$3}{10}$. Also for $\frac{\$3}{4}$.

4. In $\frac{7}{12}$ ft., into how many equal parts is the unit (1 ft.) divided? How many of these are taken? Tell the same for $\frac{5}{6}$ pie. For $\frac{3}{8}$ lb.

5. $\frac{3}{4} - \frac{1}{4}$ = how many fourths?

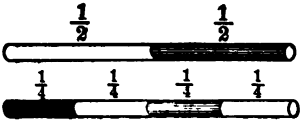
6. Which is easiest to write: $\frac{3}{4} - \frac{1}{4}$, or $\frac{2}{4}$, or $\frac{1}{2}$?

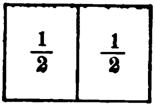
7. $\frac{5}{6} - \frac{1}{6} = ?$ What is the simplest form in which to put the answer?

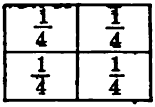


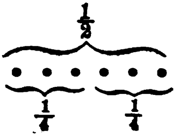
$\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$ or $\frac{1}{2}$

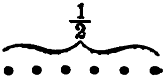
8. A boy earned $\frac{1}{2}$ dollar by shoveling snow and $\frac{1}{4}$ dollar by tending furnaces. How many quarters did he then have? How much less than 1 dollar did he then have? Than 2 dollars?

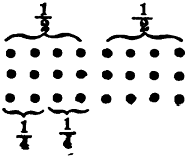












9. On the shaded rods, or on divided straight lines made by the pupil, show that $\frac{1}{2}=\frac{2}{4}$. Show the same on the line of dots. Also on the oblongs. Also on the oblong of dots.

10. Draw a circle, divide it into four equal parts, and show that $\frac{1}{2}=\frac{2}{4}$.

11. Also on the circle show that $\frac{1}{2}+\frac{1}{4}=\frac{2}{4}+\frac{1}{4}=\frac{3}{4}$. Show in like manner $\frac{1}{2}-\frac{1}{4}=\frac{?}{\text{fourths}}$.

Show these relations also on the diagrams at the top of the page.

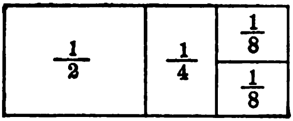
12. Fold a small square of paper to show the relations in Exs. 9–11.

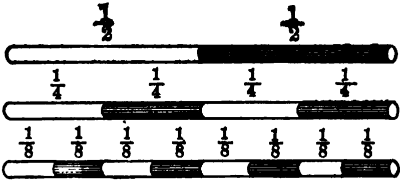
13. $\frac{3}{4}-\frac{1}{2}=\frac{?}{\text{fourths}}$. $\frac{3}{2}+\frac{1}{2}=?$

14. 1 = how many fourths? $1-\frac{1}{4}=?$ $1-\frac{3}{4}=?$ $1-\frac{1}{2}=?$ $1+\frac{1}{4}=?$ Show these relations by equal parts of a circle, as in Ex. 5.

15. Draw a picture of a foot rule with its inches divided into halves and fourths. On it show that $\frac{1}{2}=\frac{2}{4}$.

16. If you have 1 dollar and spend $\frac{3}{4}$ of a dollar for a book, what fraction of a dollar do you have left?

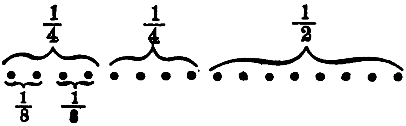


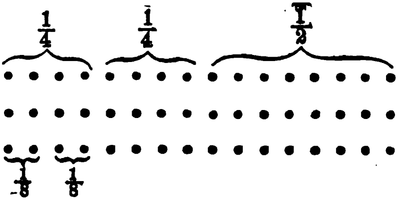


17. On divided lines show that $\frac{1}{4}=\frac{2}{8}$. $\frac{1}{2}=\frac{?}{8}$ $\frac{3}{4}=\frac{?}{8}$ $1=\frac{?}{8}$

18. Show the same on the shaded rods, the line of dots, the oblongs, and the oblong of dots.

19. Draw a circle; divide it into 8 equal parts, and show the same relations as in Ex. 17.





20. $\frac{1}{2}+\frac{1}{8}=\frac{4}{8}+\frac{1}{8}=\frac{5}{8}$. Add in like manner:

$\frac{1}{2}+\frac{3}{8}$ $\frac{1}{4}+\frac{1}{8}$ $\frac{1}{4}+\frac{3}{8}$

21. Subtract:

$\frac{1}{2}-\frac{1}{8}$ $\frac{3}{4}-\frac{1}{8}$ $\frac{5}{8}-\frac{1}{4}$ $\frac{7}{8}-\frac{5}{8}=\frac{?}{8}=\frac{?}{4}$

22. Which is easier to write: $\frac{1}{2}+\frac{3}{8}$, or $\frac{7}{8}$? $\frac{7}{8}-\frac{5}{8}$, or $\frac{1}{4}$?

23. Which would you rather have: 8 oranges, or 4 oranges? $\frac{1}{8}$ of a pie, or $\frac{1}{4}$ of a pie?

24. Would you rather saw into firewood $\frac{1}{8}$ of a cord of wood or $\frac{1}{10}$ of a cord?

25. If I divide $\frac{1}{2}$ of a cake equally among 4 children, what part of the cake will each child receive? Show this by a diagram.

26. $1 = \frac{?}{2} = \frac{?}{4} = \frac{?}{8}$. $\frac{1}{2} = \frac{?}{4} = \frac{?}{8}$. $\frac{1}{4} = \frac{?}{8}$. $\frac{3}{4} = \frac{?}{8}$. By use of diagrams and paper folding, show your results to be correct.

27. How many examples in this section can you work at sight?

28. Work again the examples on page 213.

§ 110. Reduction, Addition, and Subtraction of $\frac{1}{2}, \frac{1}{3}, \frac{1}{6}, \frac{1}{12}$

1. $\frac{1}{3}$ apple $+ \frac{1}{3}$ apple $= ?$ Which is easier to write: $\frac{1}{3} + \frac{1}{3}$, or $\frac{2}{3}$?

2. Draw a line divided into 6 equal parts.

On this line show that $\frac{1}{2} = \frac{3}{6}$, $\frac{1}{3} = \frac{2}{6}$, and $\frac{2}{3} = \frac{4}{6}$. $1 = \frac{?}{\text{sixths}}$.

3. Show the same relations on a row of 12 dots.

4. Also on a square divided into 6 equal parts.

5. On an oblong of dots 12 long and 3 wide, show the relations stated in Ex. 2.

6. Also show them on a divided circle.

7. $\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$. In like manner, $\frac{2}{3} + \frac{1}{6} = \frac{?}{6}$. $1 + \frac{1}{3} = ?$

8. $\frac{1}{3} - \frac{1}{6} = ?$ $\frac{2}{3} - \frac{1}{6} = ?$ $\frac{5}{6} - \frac{1}{6} = \frac{?}{6} = \frac{?}{3}$. $1 - \frac{1}{3} = ?$ $1 - \frac{1}{6} = ?$

9. $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$. In like manner, $\frac{1}{2} - \frac{1}{3} = \frac{?}{6} - \frac{?}{6} = \frac{?}{6}$.

10. $\frac{1}{2} + \frac{2}{3} = ?$ $\frac{2}{3} - \frac{1}{2} = ?$ $\frac{1}{2} + \frac{1}{3} + \frac{1}{6} = ?$ $\frac{1}{2} + \frac{1}{3} - \frac{1}{6} = ?$ $\frac{1}{2} + \frac{1}{6} - \frac{1}{2} = ?$ $1 - \frac{1}{2} - \frac{1}{6} = ?$

11. $\frac{1}{2}$ ft. $+ \frac{1}{6}$ ft. $= ?$ $\frac{1}{6}$ ft. $= ?$ inches. $\frac{5}{6}$ ft. $= ?$ inches.

12. A cake was divided into 6 equal parts, and John ate 1 of these parts. How many sixths were left?

13. If Mary should eat another sixth of the cake, how many sixths of the cake would be left? How many thirds?

14. Draw a line divided into twelve equal parts. On this line show that $\frac{1}{2}=\frac{6}{12}$, $\frac{1}{3}=\frac{4}{12}$, and $\frac{1}{6}=\frac{2}{12}$.

15. Show the same on a row of dots. Also on a divided square. Also on an oblong of dots. Also on a divided circle.

16. $\frac{1}{2}+\frac{1}{12}=\frac{6}{12}+\frac{1}{12}=\frac{7}{12}$. In like manner find what each of the following equals:

$\frac{1}{3}+\frac{1}{12}$ $\quad$ $\frac{1}{3}-\frac{1}{12}$ $\quad$ $\frac{1}{2}-\frac{5}{12}$ $\quad$ $\frac{5}{6}-\frac{5}{12}$ $\quad$ $\frac{2}{3}-\frac{1}{12}$ $\quad$ $\frac{5}{6}-\frac{1}{12}$

$\frac{1}{2}-\frac{1}{12}$ $\quad$ $\frac{1}{2}+\frac{5}{12}$ $\quad$ $\frac{1}{6}+\frac{1}{12}$ $\quad$ $\frac{2}{3}+\frac{1}{12}$ $\quad$ $\frac{5}{6}+\frac{1}{12}$ $\quad$ $\frac{1}{3}+\frac{5}{12}$

17. A father owns $\frac{1}{3}$ of a vessel and his son owns $\frac{1}{12}$. What part of the vessel do the father and son own together?

18. If the father should sell $\frac{1}{12}$ of the vessel, what share would he then have?

19. $1=\frac{?}{2}=\frac{?}{3}=\frac{?}{6}=\frac{?}{12}$

$\frac{1}{2}=\frac{?}{6}=\frac{?}{12}$ $\qquad$ $\frac{1}{4}=\frac{?}{12}$

$\frac{1}{3}=\frac{?}{6}=\frac{?}{12}$ $\qquad$ $\frac{2}{3}=\frac{?}{6}=\frac{?}{12}$ $\qquad$ $\frac{3}{4}=\frac{?}{12}$

20. How many of the examples of this section can you work at sight?

21. Work again the examples in § 86 (p. 216).

§ 111. Addition and Subtraction of $\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{10}$

1. On a line divided into 10 equal parts, show that

$$\frac{1}{2}=\frac{5}{10} \qquad \frac{1}{5}=\frac{2}{10} \qquad 1=\frac{5}{5}=\frac{10}{10}$$

2. $\frac{1}{2}+\frac{1}{10}=\frac{5}{10}+\frac{1}{10}=\frac{6}{10}=\frac{3}{5}$. Find in like manner the value of $\frac{1}{2}-\frac{1}{10}$.

3. $\$\frac{1}{2}-\$\frac{1}{10}=?$ $\$\frac{1}{2}+\$\frac{1}{5}=?$ $\$\frac{1}{2}-\$\frac{1}{5}=?$ $\$\frac{1}{2}+\$\frac{2}{5}=?$

4. $\frac{4}{5}-\frac{1}{2}=?$ $1-\frac{3}{10}=?$ $\frac{3}{5}+\frac{1}{2}=?$ $\frac{1}{2}+\frac{2}{5}+\frac{1}{10}=?$

5. $\$\frac{1}{10}+\$\frac{4}{10}=?$ $\$\frac{7}{10}-\$\frac{1}{5}=?$ $\$\frac{1}{2}-\$\frac{3}{10}=?$ $\frac{1}{10}$ ft. $+\frac{3}{10}$ ft. $=?$ $\frac{1}{5}$ ft. $-\frac{1}{10}$ ft. $=?$ $\frac{3}{5}$ ft. $-\frac{1}{2}$ ft. $=?$

6. Does multiplying both numerator and denominator of a fraction by the same number alter the value of the fraction? Show this by examples.

7. Does dividing both numerator and denominator of a fraction by the same number alter the value of the fraction? Show this by examples.

8. If Walter had $\frac{3}{5}$ of a melon, and gave his brother $\frac{1}{10}$ of the melon, how many tenths would he have left?

9. If Walter then ate another tenth, how many tenths would he have left?

10. If one tenth of a melon costs 5¢, what will the whole melon cost? What will 3 tenths cost? What will $\frac{2}{5}$ cost?

11. $1=\frac{?}{5}=\frac{?}{10}$. $\frac{1}{2}=\frac{?}{10}$.

12. How many of the examples in this section can you work at sight?

13. Practice multiplication and division by 3-figured numbers.

14. Let the teacher name some fraction from the following table and let the pupil give from memory the other fractions equal to the given fraction:

1	$\frac{2}{2}$	$\frac{3}{3}$	$\frac{4}{4}$	$\frac{5}{5}$	$\frac{6}{6}$	$\frac{8}{8}$	$\frac{10}{10}$	$\frac{12}{12}$
$\frac{1}{2}$	$\frac{2}{4}$	$\frac{4}{8}$	$\frac{3}{6}$	$\frac{6}{12}$	$\frac{5}{10}$			

$\frac{1}{3}$	$\frac{2}{6}$	$\frac{6}{12}$
$\frac{2}{3}$	$\frac{4}{6}$	$\frac{8}{12}$

$\frac{1}{4}$	$\frac{2}{8}$	$\frac{3}{12}$
$\frac{3}{4}$	$\frac{6}{8}$	$\frac{9}{12}$

§ 112. Multiplication of Fractions

1. $\frac{1}{3}$ taken twice = ? Show this on a divided line. Also on a divided square. Also on a folded oblong of paper or on an array of dots.

2. $\frac{1}{6}$ taken twice $= \frac{?}{\text{sixths}} = \frac{?}{\text{thirds}}$. Show this on various diagrams.

3. $\frac{1}{12}$ taken twice = ? Show this on various diagrams.

4. $\frac{1}{12}$ taken three times = ? Show this on various diagrams. Also show what $\frac{1}{12}$ taken four times equals.

5. Which is easier to write: $2 \times \frac{1}{3}$, or $\frac{2}{3}$? $2 \times \frac{1}{6}$, or $\frac{1}{3}$?

6. Tell the value of 2 times $\frac{1}{4}$.

$2 \times \frac{1}{4}$ $2 \times \frac{1}{8}$ $3 \times \frac{1}{5}$ $4 \times \frac{1}{6}$ $8 \times \frac{1}{12}$

$3 \times \frac{1}{2}$ $2 \times \frac{2}{3}$ $4 \times \frac{1}{10}$ $6 \times \frac{1}{12}$ $3 \times \frac{2}{3}$

7. Multiply and reduce each result to its simplest form:

$2\times\frac{1}{6}$ $3\times\frac{1}{6}$ $4\times\frac{1}{6}$ $6\times\frac{1}{8}$ $2\times\frac{3}{8}$

$3\times\frac{1}{12}$ $2\times\frac{5}{12}$ $4\times\frac{1}{12}$ ft. $8\times\frac{1}{12}$ ft. $5\times\$\frac{1}{10}$

$4\times\frac{1}{20}$ $5\times\frac{1}{20}$ $6\times\frac{1}{24}$ ft. $8\times\frac{1}{24}$ ft. $6\times\frac{1}{12}$ ft.

8. Henry ate $\frac{1}{6}$ of a melon and Harold ate twice as much. How much did Harold eat?

9. Alice has $\frac{3}{8}$ of a yard of velvet and Bertha has twice as much. How much has Bertha?

10. Mr. Harris owns $\frac{1}{8}$ of a vessel and his father owns twice as much. How much does his father own?

11. A son owns $\frac{5}{24}$ of a cranberry bog, and his father owns three times as much. How much does the father own?

12. How many of the examples in this section can you work at sight?

13. Work again the examples in § 91 (p. 230).

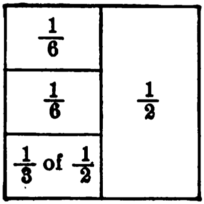
§ 113. Division of Fractions

1. One half of $\frac{2}{3}$ = how many thirds? Show this on a divided line and other diagrams. $\frac{1}{2}$ of $\frac{2}{3}=$? $\frac{2}{3}\div 2=$?

2. $\frac{1}{2}$ of $\frac{4}{5}=$? $\frac{1}{3}$ of $\frac{3}{8}=$?

3. Find the value of

$\frac{4}{7}\div 2$ $\frac{5}{8}$ in. $\div\, 5$ $\frac{5}{12}$ ft. $\div\, 5$ $\frac{6}{7}$ yd. $\div\, 3$



4. On the diagram we see that

$$\tfrac{1}{3} \text{ of } \tfrac{1}{2} = \tfrac{1}{6}.$$

In like manner, by a diagram, find the value of $\frac{1}{2}$ of $\frac{1}{3}$.

5. Also find the value of

$\frac{1}{2}$ of $\frac{1}{5}$ $\frac{1}{3}$ of $\frac{1}{4}$ $\frac{1}{2}$ of $\frac{1}{4}$ $\frac{1}{2}$ of $\frac{1}{6}$

6. Another way of writing $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{3} \div 2$. Hence, give the value of

$\frac{1}{2} \div 3$ $\frac{1}{4} \div 3$ $\frac{1}{3} \div 4$ $\frac{1}{6}$ ft. $\div 2$ \$$\frac{1}{2} \div 5$ $\frac{2}{5} \div 4$
$\frac{1}{6} \div 2$ $\frac{1}{5} \div 2$ $\frac{1}{4} \div 3$ $\frac{1}{4}$ ft. $\div 3$ $\frac{2}{3} \div 4$ $\frac{1}{5} \div 4$

7. Another way of writing $\frac{1}{2}$ of $\frac{1}{3}$ is $\frac{1}{2} \times \frac{1}{3}$. Hence, give the value of

$\frac{1}{2} \times \frac{1}{5}$ $\frac{1}{2} \times \frac{1}{4}$ $\frac{1}{4} \times \frac{1}{3}$ $\frac{1}{3} \times \frac{6}{7}$ $\frac{1}{5} \times \frac{5}{12}$
$\frac{1}{3} \times \frac{1}{2}$ $\frac{1}{2} \times \frac{3}{5}$ $\frac{1}{3} \times \frac{1}{4}$ $\frac{1}{4} \times \frac{2}{5}$ $\frac{1}{6} \times \frac{3}{8}$

8. If $\frac{2}{5}$ of a cake is divided into 4 equal parts, how large will each part be?

9. A father owned $\frac{3}{4}$ of a vessel and divided this equally among his 6 children. What share in the vessel did each child then own?

10. Draw a line 4 inches long. Take a piece of paper $\frac{1}{2}$ inch long and apply it to the line. How many times will the paper be contained in the line? $4 \div \frac{1}{2} = ?$

11. 2 in. $\div \frac{1}{2}$ in. = ? $4 \div \frac{1}{4} = ?$ $1 \div \frac{1}{4} = ?$ $3 \div \frac{1}{6} = ?$
3 in. $\div \frac{1}{2}$ in. = ? $8 \div \frac{1}{4} = ?$ $2 \div \frac{1}{3} = ?$ $4 \div \frac{1}{8} = ?$

12. Work Exs. 6–15 on page 231 as oral examples.

13. How many examples of this section can you work at sight?

§ 114. Addition and Subtraction of Mixed Numbers

1. Add $\$5\frac{1}{2}$ and $\$6\frac{1}{2}$.

WRITTEN WORK

$$\begin{array}{rl} \$5\frac{1}{2} & \\ \underline{\$6\frac{1}{2}} & \\ \$12 & \textit{Sum} \end{array}$$

EXPLANATION

We have $\$\frac{1}{2} + \$\frac{1}{2} = \$1$.
Then, $\$1 + \$6 + \$5 = \$12$.

> *Definition*
>
> A **mixed number** is a number made up of a whole number and a fraction.

2. Add $12\frac{2}{3}$ and $5\frac{1}{2}$.

WRITTEN WORK

$$\begin{array}{r|c|c} 12 & \cancel{\frac{2}{3}} & \frac{4}{6} \\ 5 & \cancel{\frac{1}{2}} & \frac{3}{6} \\ \hline 17 & & \frac{7}{6} \\ \hline \multicolumn{3}{l}{18\frac{1}{6} \;\; \textit{Sum}} \end{array}$$

EXPLANATION

In order to add $\frac{2}{3}$ and $\frac{1}{2}$ we reduce them both to sixths.

We then add $\frac{4}{6}$ and $\frac{3}{6}$ and obtain $\frac{7}{6}$ as their sum.

Then $\frac{7}{6} = \frac{6}{6} + \frac{1}{6}$, or $1\frac{1}{6}$. $17 + 1\frac{1}{6} = 18\frac{1}{6}$.

3. Add:

$\$7\frac{1}{2}$	$\$5\frac{3}{4}$	$27\frac{1}{2}$	$67\frac{3}{4}$	$7\frac{3}{8}$	$15\frac{1}{6}$
$\$5\frac{1}{2}$	$\$2\frac{1}{4}$	$5\frac{1}{4}$	$14\frac{1}{2}$	$6\frac{3}{4}$	$5\frac{5}{12}$

4. Add:

$82\frac{1}{2}$	$92\frac{1}{4}$	$106\frac{1}{2}$	$12\frac{1}{2}$ T.	$7\frac{1}{2}$	$6\frac{2}{3}$
$17\frac{1}{8}$	$19\frac{1}{8}$	$72\frac{5}{8}$	$5\frac{3}{4}$ T.	$5\frac{1}{3}$	$4\frac{1}{4}$

5. Add:

$5\frac{1}{2}$	$6\frac{3}{8}$	$15\frac{1}{2}$	$5\frac{1}{6}$	$15\frac{1}{2}$	$12\frac{1}{2}$
$3\frac{1}{4}$	$5\frac{1}{8}$	$15\frac{1}{2}$	$2\frac{1}{3}$	$14\frac{1}{5}$	$13\frac{1}{4}$
$2\frac{1}{4}$	$4\frac{1}{4}$	$15\frac{1}{2}$	$3\frac{1}{3}$	$13\frac{1}{10}$	$32\frac{1}{8}$

6. A man had $17\frac{1}{2}$ gal. of vinegar in a barrel, and put into the barrel $5\frac{1}{2}$ gal. more. How many gallons were then in the barrel?

7. Marion needs $3\frac{1}{4}$ yd. of cloth for a jacket, and $6\frac{3}{4}$ yd. for a skirt. How many yards does she need for the whole suit?

8. A man owned $67\frac{3}{4}$ acres and bought $12\frac{1}{2}$ more acres. How many did he then have?

9. A farmer cut $3\frac{1}{2}$ tons of hay on one field, $2\frac{1}{4}$ on another, and $3\frac{1}{4}$ on another. How many tons did he cut in all?

10. If a field is a rectangle $212\frac{3}{4}$ ft. long and $112\frac{1}{2}$ ft. wide, find the length of the fence around the field.

11. Subtract:

\$ $5\frac{3}{4}$	$17\frac{1}{2}$	$18\frac{3}{4}$	$20\frac{5}{6}$	$20\frac{1}{4}$
$1\frac{1}{4}$	5	$12\frac{1}{2}$	$5\frac{1}{6}$	$5\frac{1}{8}$

12. Subtract:

$5\frac{1}{3}$	$3\frac{1}{3}$	$7\frac{1}{2}$	$8\frac{2}{3}$	20
$4\frac{1}{12}$	$2\frac{1}{6}$	$5\frac{1}{5}$	$5\frac{1}{2}$	$5\frac{1}{2}$

13. Subtract:

$20\frac{1}{4}$	$30\frac{1}{2}$	$62\frac{1}{4}$	$72\frac{3}{5}$	$17\frac{2}{3}$
$5\frac{1}{2}$	$15\frac{1}{6}$	$12\frac{1}{8}$	$61\frac{3}{10}$	$5\frac{1}{4}$

14. From a barrel containing $31\frac{1}{2}$ gal. of molasses, a merchant sold 12 gal. How can he tell how many gallons he has left, without measuring what is left?

15. How many feet in a rod? Tom can make a running jump of $12\frac{1}{4}$ ft. How much less than a rod is this?

16. Last night the ice on the pond was $4\frac{1}{2}$ in. thick; this morning it is $5\frac{3}{4}$ in. thick. How much has it frozen during the night? If we are to wait till the ice is 7 in. thick before we cut it, how much more will it have to freeze?

17. Review multiplication and division by 3-figured numbers, by working examples drawn from a box.

§ 115. Fractional Parts of Whole Numbers; Multiplication with Mixed Numbers

1. How many inches in $\frac{1}{4}$ of a foot? In $\frac{3}{4}$ of a foot?

2. What is $\frac{1}{4}$ of 72? $72 \div 4 = ?$ What does 3 times $\frac{1}{4}$ of 72 equal? $\frac{3}{4} \times 72 = ?$

3. Find $\frac{3}{4}$ of 476.

$$\begin{array}{r l} 4\overline{)476} & \\ \hline 119 & (=\tfrac{1}{4}\text{ of }476) \\ 3 & \\ \hline 357 & (=\tfrac{3}{4}\text{ of }476) \end{array}$$

4. $\frac{1}{3}$ of a cubic foot = how many cubic inches? $\frac{2}{3}$ of a cubic foot = ?

5. Find the value of

(1) $\frac{3}{4}$ of 824 *(3)* $\frac{5}{6}$ of 1326 *(5)* $\frac{4}{7}$ of 1547
(2) $\frac{3}{4} \times 996$ *(4)* $1024 \times \frac{5}{8}$ *(6)* $8740 \times \frac{3}{5}$

6. Mr. Williams earns \$3.60 a day. His son, who is an apprentice, gets $\frac{2}{5}$ as much. How much does the son get?

7. From New York to Philadelphia the distance is 90 miles. A boy rides $\frac{5}{6}$ of the way and walks the remainder; how many miles does he walk? How many miles does he ride?

8. Mr. Swift runs a certain farm on shares. He supplies labor and fertilizers, and gets $\frac{2}{3}$ of the crops. If he raises 672 bushels of wheat, what is his share? What is the value of this at 95¢ a bushel?

9. If he received $\frac{5}{8}$ of the crops, what would be the value of the wheat crop to him? If he received $\frac{4}{7}$?

10. It is often more convenient, in working an example like Ex. 3, to perform the operations in reverse order, thus:

$$\begin{array}{rr} & 476 \\ & 3 \\ \cline{2-2} 4) & 1428 \\ \cline{2-2} & 357 \end{array} \ \textit{Ans.}$$

Work Exs. 5–9 in this way.

11. Multiply 75 by $6\frac{3}{5}$.

WRITTEN WORK

$$\begin{array}{rrl} & 75 & \\ & 6\frac{3}{5} & \\ \cline{2-2} & 15 & (= \frac{1}{5} \text{ of } 75) \\ & 3 & \\ \cline{2-2} & 45 & (= \frac{3}{5} \text{ of } 75) \\ & 450 & (= 6 \times 75) \\ \cline{2-2} \textit{Product} & 495 & (= 6\frac{3}{5} \times 75). \end{array}$$

ANOTHER FORM OF THE WORK

$$\begin{array}{rrl} & 75 & \\ & 6\frac{3}{5} & \\ \cline{2-2} 5) & 225 & (= 3 \times 75) \\ \cline{2-2} & 45 & (= \frac{3}{5} \text{ of } 75) \\ & 450 & (= 6 \times 75) \\ \cline{2-2} & 495 & (= 6\frac{3}{5} \times 75) \end{array}$$

12. Multiply: (*1*) $\begin{array}{r} \$75 \\ \underline{8\frac{3}{5}} \end{array}$ (*2*) $\begin{array}{r} 60 \\ \underline{5\frac{2}{5}} \end{array}$ (*3*) $216 \times 6\frac{5}{6}$

(*4*) $420 \times 14\frac{2}{3}$ (*5*) $480 \times 3\frac{5}{12}$ (*6*) $9236 \times 32\frac{3}{4}$

13. If the price of 1 lb. of beef is 24¢, what is the cost of $2\frac{3}{4}$ lb.? What is the change for one dollar?

14. What is the cost of 18 lb. 4 oz. of turkey at 24¢ a pound?

15. If a man works for $16\frac{1}{2}$ cents an hour and works 44 hours during the week, what are his week's wages? If he spends $ 7 during the week, how much does he save?

16. Our yard is a square $32\frac{1}{2}$ ft. on each side. Add the sides and find the length of the fence around the yard.

Can you think of any shorter way of getting the length of the fence?

17. On squared paper draw a diagram of a yard 32 ft. square, using 1 space to stand for 4 feet.

18. What is the railroad fare for 180 miles at $2\frac{1}{2}$¢ a mile? At $2\frac{1}{4}$¢?

19. What is the cost of $16\frac{1}{2}$ yd. of dress goods at 48¢ a yard?

20. What is the cost of two 100-lb. kegs of nails at $4\frac{1}{2}$¢ a pound? If by paying cash I get the nails for $4\frac{1}{4}$¢ a pound, how much do I save? (What is the shortest way to compute the amount saved?)

21. How many yards in one rd.? In 320 rd.?

22. How many feet in one rod? In 320 rd.? In 640 rd.? In 100 rd.?

23. If a boy's step or pace is $2\frac{1}{4}$ ft., how far does he go in walking 400 paces?

24. A yard is $47\frac{1}{2}$ ft. long and 22 ft. wide. Find its area.

25. A cellar is 18 ft. long, 12 ft. wide, and $6\frac{1}{2}$ ft. deep. What will it cost to dig the cellar at $2\frac{1}{2}$¢ a cubic foot?

26. A man works in one week 52 hours at $22\frac{1}{2}$¢ an hour, and 4 hours over time at double pay. What does he earn during the week?

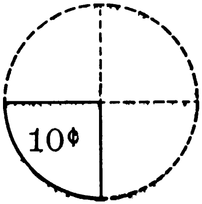
27. If he works 280 days during a year and makes \$ $2\frac{3}{4}$ a day and spends \$ $2\frac{1}{4}$ a day, find in the shortest way the amount of his savings for the year.

28. Multiply the following as sight examples:

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
24	20	40	64	36	72
$3\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$1\frac{1}{2}$	$2\frac{1}{4}$	$3\frac{1}{3}$
(7)	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
\$84	108	40	36	64	106
$3\frac{1}{4}$	$1\frac{1}{2}$	$5\frac{1}{2}$	$2\frac{1}{3}$	$4\frac{1}{4}$	$5\frac{1}{2}$

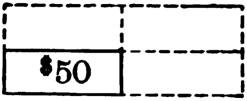
§ 116. Analysis with Fractions

1. If $\frac{1}{4}$ of a cake costs 10¢, what will $\frac{3}{4}$ of the cake cost? The whole cake?



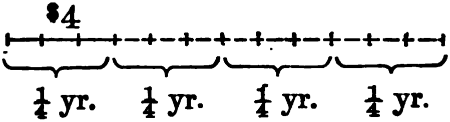
Solution

Cost of $\frac{1}{4}$ of cake = 10¢.
“ $\frac{3}{4}$ “ $= 3 \times 10¢ = 30¢$.
“ $\frac{4}{4}$ “ $= 4 \times 10¢ = 40¢$.

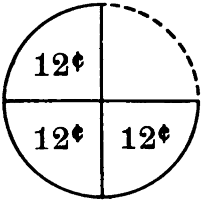


2. If $\frac{1}{4}$ of an oblong lot of ground costs $ 50, what will the whole lot cost? On squared paper draw a diagram illustrating this.

3. If I pay $ 4 for the use of a certain sum of money for 3 months ($\frac{1}{4}$ of a year), what must I pay for its use for the whole year?



4. If $\frac{3}{4}$ of a cake costs 36¢, what will the whole cake cost?



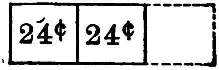
SOLUTION

Cost of $\frac{3}{4}$ of cake = 36¢.
" $\frac{1}{4}$ " = $\frac{1}{3}$ of 36¢ = 12¢.
" $\frac{4}{4}$ or whole cake = 4 × 12¢ = 48¢.

5. If $\frac{3}{4}$ of an oblong lot of ground costs $ 120, what will the whole lot cost? Diagram this problem.

6. If I pay $ 60 for the use of a sum of money during $\frac{2}{3}$ of the year, what must I pay for its use during the whole year? Draw a diagram to illustrate this (see diagram of Ex. 3).

7. If $\frac{2}{3}$ of a yard of silk costs 48¢, what will a whole yard cost?



8. If $\frac{5}{6}$ of a pie costs 35¢, what will a whole pie cost? (Draw diagram.)

9. If $\frac{5}{12}$ of a lot of ground costs $85, what does the whole lot cost? (Draw diagram.)

10. If $\frac{3}{4}$ of a yard of silk costs 60¢, what will 1 yard cost? (Draw diagram.)

11. If $\frac{7}{8}$ of a vessel is worth $8400, what is the whole vessel worth?

12. If Helen is ill and her pulse beats 35 times in 20 seconds (or $\frac{1}{3}$ of a minute), how many times does it beat in 1 minute?

13. If $1\frac{1}{2}$ lb. of beefsteak cost 33¢, what will 1 lb. cost?

14. If $\frac{3}{4}$ lb. of tea cost 45¢, what will $\frac{1}{2}$ lb. cost?

15. Work Exs. 2–8 of this section as oral examples.

16. Have a card drill in examples in cancellation.

§ 117. Liquid and Dry Measure

1. If we combine all the units we have used in measuring liquids (see pp. 37, 38), and add that 4 gills (gi.) = 1 pint, we may form the following table, which will be convenient for reference:

Table for Liquid Measure

4 gills (gi.) = 1 pint (pt.).
2 pt. = 1 quart (qt.).
4 qt. = 1 gallon (gal.).

A common glass or tumbler holds about $\frac{1}{2}$ pint of liquid.

A pint is frequently divided into 16 fluid ounces. Hence a common tumbler holds 8 fluid ounces.

2. How many gills in a quart? How many tumblers may be filled from a quart measure? Try this.

3. How many children can receive a glass of milk each from a pitcher containing 2 quarts?

4. How many pints in a gallon? In 2 gallons? In 3 gallons and 2 quarts?

5. Why do we use measures of different sizes in measuring fluids?

6. In 20 pints, there are how many gallons and how many quarts left over? In selling 20 pints of vinegar in one order, what measures will it be most convenient for the storekeeper to use, and how many times will he use each measure?

7. If a gallon of ice cream costs $1.60, what will 1 pint cost? 3 pints?

8. A gallon is called a "higher unit" of measure than a quart, pint, or gill. A quart is a higher unit than a pint or gill. Reduce each of the following to higher units as far as possible:

(*1*) 24 pt.
(*2*) 30 pt.
(*3*) 15 qt.
(*4*) 40 pt.
(*5*) 25 pt.
(*6*) 44 gi.

WRITTEN WORK

2)24 pt.
4)12 qt.
3 gal. *Ans.*

EXPLANATION

24 pt. = $\frac{24}{2}$ qt. = 12 qt.
12 qt. = $\frac{12}{4}$ gal. = 3 gal.

9. How many pints in each of the following?

3 qt. 1 pt. 5 qt. 1 pt. 1 gal. 2 qt. 3 gal. 1 pt.

WRITTEN WORK	EXPLANATION
3 qt. 1 pt. 2 6 pt. 1 pt. 7 pt. *Ans.*	3 qt. = 3 × 2 pt. = 6 pt. 6 pt. + 1 pt. = 7 pt.

10. Add 4 gal. 2 qt. to 2 gal. 1 qt.

11. In a school one glass of milk is to be given with their lunch to each of 48 children. What is the easiest way the milkman can measure the milk to be left at the school?

12. Answer the question in Ex. 11 for a school of 72 children. 100 children. 150 children.

13. Let the pupil collect the units used in dry measure (see pp. 154–155) and form a table for dry measure similar to that given for liquid measure on page 291.

14. How many quarts in a bushel? How many pints? If you had to measure a large quantity of corn, would you use the bushel or the pint measure? Why?

15. Name some objects usually measured by the pint measure. Also some usually measured by the bushel. Why is the pint measure used in the one case and the bushel measure in the other?

16. In 80 quarts, there are how many bushels and how many pecks left over? In selling 80 quarts of corn in one order, by the use of what measures can the storekeeper measure out the 80 quarts most rapidly?

17. Reduce each of the following to higher units of dry measure as far as possible:

(*1*) 72 quarts
(*2*) 100 quarts
(*3*) 160 pints
(*4*) 72 quarts + 4 pints

18. Reduce the following to quarts:

(*1*) 5 pk. + 3 qt.
(*2*) 1 bu. + 3 qt.
(*3*) 2 bu. + 4 pk.
(*4*) 3 bu. + 4 pk. + 1 qt.

19. Carl went chestnutting, and on Tuesday got 2 qt. + 1 pt., on Wednesday 3 qt., on Thursday 3 pt., on Friday 3 qt. + 1 pt. How much more than a peck did he gather in all?

20. Mr. Smith has 2 bushels of oats. How many days will these last his horse if he feeds the horse 8 quarts per day?

21. Play the game of drawing to scale.

§ 118. Measures of Weight and Length

1. Collect the measures of weight and form a table for weight. (See pp. 99, 222.)

2. Reduce:

(*1*) 4 lb. 3 oz. to ounces.
(*2*) 2 T. 150 lb. to pounds.
(*3*) 8 cwt. 75 lb. to pounds.
(*4*) 8 T. 3 cwt. to pounds.

3. How many tons in 3000 lb.? In 5000 lb.?

4. What will 3000 lb. of hay cost at $ 18 a ton? What will 2500 lb. cost? 3500 lb.?

5. 3 cwt. of mixed feed will last how many days, if 20 lb. are fed per day? If the feed costs 80¢ per cwt., what is the cost per day?

6. 5 oz. is what fraction of a pound?

7. What is the cost of 8 lb. 4 oz. of turkey at 32¢ a pound?

8. Why do we not buy coal by the pound?

9. $\frac{1}{4}$ lb. + $\frac{1}{8}$ lb. = $\frac{?}{\text{eighths}}$ lb. How many ounces does it equal?

10. $\frac{3}{4}$ lb. + $\frac{3}{8}$ lb. + $\frac{1}{16}$ lb. = ? lb. = ? oz.

11. If a pint of water weighs a pound, how many pounds does a gallon weigh? A quart? A tumbler full?

12. Collect the measures of length, and form a table for long measure. (See pp. 75, 76, 193.)

13. **Reduce:**

(*1*) 2 ft. 6 in. to inches.
(*2*) 2 yd. 1 ft. to inches.
(*3*) 2 yd. 1 ft. 6 in. to inches.
(*4*) 3 mi. 100 rd. to rods.

14. How many feet wide is a building lot which is 4 rods wide? Also one which is 3 rods wide?

15. If a running track is $\frac{1}{4}$ of a mile long, how many times must a runner go around it in order to run 2 miles?

16. Each step of a certain boy is 2 ft. long and he takes 240 steps in going from home to school. If he walks this distance 20 times in a week, how many feet does he go? How many yards?

17. How many feet in $\frac{2}{3}$ of a mile? In $\frac{1}{4}$ of a mile? In $\frac{5}{6}$ of a mile?

18. If 5 railroad ties are laid for every 10 feet of track, how many ties are required for a mile? What is their cost at 75¢ a tie?

19. If a board 16 ft. long and 1 ft. wide is worth $ 1.28, what is the value of a similar board 8 ft. long? One 12 ft. long? One 4 ft. long?

20. Name some house or building which you think is a mile from your school.

21. Which is easier: to use the foot measure 33 times, or the rod measure twice? What, then, is the use of the rod measure?

§ 119. Measures of Area and Volume

1. Collect the measures of surface, and form a table for square measure. (See p. 209.)

Use also 4840 sq. yd. = 1 acre (A.),
and 43,560 sq. ft. = 1 acre.

2. Reduce:

(*1*) 3 sq. yd. 5 sq. ft. to square feet.
(*2*) 2 sq. ft. 56 sq. in. to square inches.
(*3*) 4 sq. yd. 2 sq. ft. to square inches.
(*4*) 96 sq. ft. to square inches.
(*5*) 720 sq. yd. to square feet.

3. How many square feet in $\frac{1}{2}$ of an acre? In $\frac{1}{4}$ A.? In $\frac{3}{4}$ A.? How many square yards in each of these?

4. Is a field 100 yd. long and 40 yd. wide greater or less than 1 acre? A field 100 yd. × 50 yd.?

5. How many square feet in a rug 12 ft. by 18 ft.? How many square yards? What is the cost of the rug at $1.25 a square yard?

6. What is the rule for computing the area of a rectangle? What is the formula?

7. If a floor is to contain 660 sq. ft. and be 20 ft. wide, how long must the floor be?

8. A certain yard is 80 ft. wide and 250 ft. long. On it is a house 30 ft. by 50 ft. and a barn 20 ft. by 25 ft. How much of the yard is not covered by buildings? If a road 80 ft. long and 5 ft. wide runs across the lawn, how

much of the yard is left for grass? Draw a diagram showing a possible arrangement of such a yard and buildings.

To the Teacher. Problems like Ex. 8 and Exs. 14–18 may be assigned as extra work for pupils who work rapidly.

9. Collect the measures of volume, and make a table for cubic measure. (See pp. 257, 265.)

10. How many cubic feet in 3 cu. yd.? In 4 cu. yd.? 5 cu. yd.?

11. How many cubic inches in 9 cu. ft.? In 9 cu. ft. + 120 cu. in.?

12. Reduce 128 cubic feet to cubic yards.

13. $\frac{1}{3}$ cu. yd. + $\frac{1}{9}$ cu. yd. = $\frac{?}{9}$ cu. yd. = ? cu. ft.

14. How many cubic feet must be removed in digging a cellar 28 ft. long, 18 ft. wide, and 6 ft. deep? How many cubic yards? If 1 cubic yard = 1 cartload, how many cartloads must be removed? What will be the cost of digging the cellar at 10 ¢ a cartload?

15. If a water tank is 12 ft. long and 8 ft. wide, how many cubic feet of water does it contain, if the water is 1 ft. deep? 2 ft. deep? 4 $\frac{1}{2}$ ft. deep?

16. If the tank in Ex. 15 is 7 ft. deep and if water weighs 62$\frac{1}{2}$ lb. a cu. ft., what will be the weight of the water in the tank when the tank is full? How many tons is this?

17. A bin full of potatoes is 80 ft. long, 6 ft. wide, and 4 ft. deep. If the number of bushels in it equals $\frac{4}{5}$ of the number of cubic feet, how many bushels does the bin contain?

Is it easier to compute the number of bushels in this way, or to take the potatoes out and measure them?

18. How many hours would it take to measure 1536 bushels of potatoes, if you can measure 30 bushels an hour?

§ 120. Measures of Time; Other Units of Measure

12
1
2
3
4
5
6
7
8
9
10
11
January April July October
February May August November
March June September December
Sun Mon Tue Wed Thu Fri Sat
1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31

1. Collect the measures of time, and form a table for time. (See pp. 64, 65, 211.)

2. Reduce:

(*1*) 37 min. 52 sec. to seconds.

(*2*) 4 hr. 15 min. to minutes.

(*3*) 2 hr. 12 sec. to seconds.

(*4*) 3 hr. 5 min. 8 sec. to seconds.

3. Reduce each of the following to higher units as far as possible:

(*1*) 2400 sec.
(*2*) 3000 min.
(*3*) 2500 sec.
(*4*) 35,000 sec.

4. Walter is 12 years 8 months old and his younger brother is 9 years 5 months old. How much older is Walter?

5. How many minutes long is one of our recitations?

6. How many minutes since our recitation began?

7. How many hours and minutes before school is to close?

8. If a boy runs $\frac{1}{4}$ of a mile in 53 seconds, how many feet does he run in 1 second?

9. If a man gets 24¢ for working an hour, how much will he get for working 2 hr. and 45 min.? 8 hr. 20 min.?

10. How much does the man (in Ex. 9) get for working from 7:30 A.M. to 11:15 A.M.? From 10 A.M. to 5 P.M., with an intermission of one hour at noon?

11. Why does not a boy state his age as so many seconds, say, 3,929,872 seconds?

Special Table for Numbers

12 units = 1 dozen.
12 dozen = 1 gross.
20 units = 1 score.

12. How many units in $\frac{3}{4}$ of a dozen? In $\frac{5}{6}$ of a dozen? In one gross?

13. How many dozen in 3 gross and 5 dozen? In 3 gross and 5 units?

14. A bookseller buys a gross of lead pencils for $4.75, and sells them at 6¢ a pencil. How much does he make?

15. If eggs sell at 60¢ a score, what is the cost of 1 egg? Of 7 eggs? Of 19 eggs?

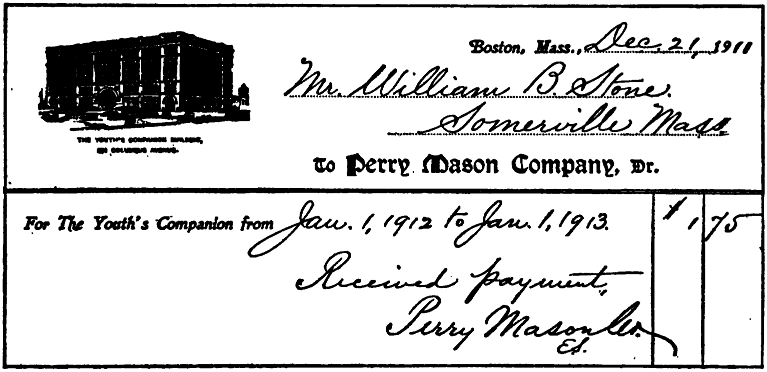
16. Which is better: to buy eggs at 50¢ a score, or at 30¢ a dozen?

17. Which is better: to sell eggs at 60¢ a score, or at 36¢ a dozen?

18. Count by 12's from 12 to 144.

19. How many units in 5 dozen? In 6 dozen? 8 dozen?

§ 121. Bills and Accounts



Boston, Mass., Dec. 21, 1911

Mr. William B. Stone.

Somerville Mass.

To Perry Mason Company, Dr.

For The Youth's Companion from Jan. 1, 1912 to Jan. 1, 1913. $1 75

Received payment,

Perry Mason Co.

E.S.

1. To whom is this bill made out (or addressed)? Who receipted it?

2. Copy this receipted bill. Now try to make one like it without looking at the copy or the book.

3. Make out a bill addressed to yourself for 2 years' subscription to *The Youth's Companion*.

4. Using the market report on page 182, make out a bill addressed to your teacher for three articles from some market you know. Ask your teacher to receipt the bill if it is correct.

5. Make out a bill addressed to yourself from some well-known store for the following articles: 1 pair of gloves @ $ 1.00, 5 yards of ribbon @ 25 cents a yard, and 2 collars @ 25 cents each. (The sign @ means *at.*)

6. Play the game of making out and receipting bills.

To the Teacher. See Note 42 concerning Bills and Accounts (p. 363).

§ 122. Saving Labor by the Use of Letters; Approximations; Estimates

To the Teacher. This lesson may be deferred until the next grade, if the teacher prefers.

1. If $a = \$712$ and $b = \$623$, find the value of $a + b$.

$$\begin{array}{r} \$712 = a \\ \underline{\$623 = b} \\ \$1335 = a + b \end{array}$$

2. Find $a - b$, using the numbers given in Ex. 1.

3. Which is easier to write: $\$712 + \$623$, or $a + b$? Also $\$712 - \$623$, or $a - b$?

4. If $a = \$627$, $b = \$512$, $c = \$209$, find $a + b + c$. Also $a + b$. Also $a + c$. Also $a - b$. Also $a - c$. Also $a + b - c$.

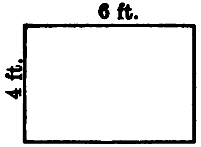
5. On page 148 is the rule for finding the area of a rectangle. Write again the formula you worked out in Ex. 10, p. 267. In like manner we have

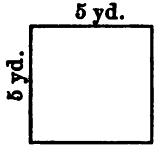
Formula for Area

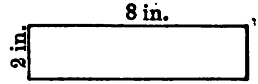
$$\mathbf{A = l \times w}$$

6. Find the area of each of the following rectangles by use of the formula, pointing out the value of l, w, and A:

It is to be remembered that in the formula only like units can be used together. Thus, if l stands for a number of feet, then w cannot be in inches or yards, but must be feet also.







7. Work again the examples in § 102 (p. 260).

8. Sometimes we do not care to know the exact product of the given numbers, but only wish to know whether the product of the numbers is less or greater than a given number. Is 99×7 greater or less than 1000? $100 \times 7 = 700$, hence the product of the given number must be less than 1000.

9. Which of the following is greater: the indicated product, or the number to the right of it?

INDICATED PRODUCT	NUMBER	INDICATED PRODUCT	NUMBER
99 × 6	800	315 × 3¢	$10
998 × 7	7000	500 × 4¢	$25
101 × 9	800	1000 × 9¢	$100
989 × 8	800	2000 × 9¢	$200
800 × 8¢	$100	1000 × 21¢	$200

10. A farmer has 950 bushels of wheat, which he expects to sell for 95¢ a bushel, and wants to know whether the receipts will enable him to pay a note of $1000. Can you tell without doing any written work?

11. Which is greater: 10 ft., or 3 yd.? 2 ft., or ½ yd.?

12. Which is heavier: 2 lb., or 4 oz.? 2 lb., or 8 oz.?

13. Which is greater: 1½ gal., or 10 pt.? 2 gal., or 15 pt.?

14. Will a ton of hay at 5¢ a pound cost $10 or $100?

15. What is the highest order of units in the product of 70 by 90, hundreds or thousands?

If, in multiplying two numbers like 73 and 94, you begin by estimating the product of the main units (70 × 90), a large error in the result of the work is often prevented. Illustrate by several examples.

§ 123. Review (Topical)

1. Make as many different numbers as you can out of 5 and 1. Which of these numbers is the largest? Why?

Treat 5, 1, 3 in the same way. Also 5, 1, 3, 0.

2. In 56,765, how many units does each figure stand for, and what is the size of each of these units? How much greater is the value of the 6 to the left than that of the 6 to the right?

How much greater is the value of the 5 to the left than that of the 5 to the right?

3. If I owe a debt of $947, how many bills will be needed to pay it, if I use only hundred, ten, and one-dollar bills? If I use only one-dollar bills?

If I count 40 bills per minute, how long will it take to count out the bills in each case?

4. If a butcher paid seventy-four dollars and thirty cents for some beef and sold the same for one hundred seven dollars and twelve cents, can you tell by reading

these words how much he made? Now use figures instead of words and find out how much he made.

5. Write in Roman numerals the numbers from one hundred twenty-five to one hundred fifty.

6. A book contains 286 pages and XIII chapters. Find the average number of pages in a chapter.

7. Reduce to simplest form (*i.e.* add):

$$72{,}654 + 81{,}963 + 9206 + 48{,}133 + 919 + 37{,}264.$$

8. Work Ex. 10, p. 271; time yourself while working it, and note your improvement in speed since you first worked this example.

9. Add:

(1)	*(2)*	*(3)*	*(4)*	*(5)*
$\$6.72\frac{1}{2}$	$\$4.62\frac{1}{2}$	$19\frac{1}{2}$	$9\frac{5}{6}$	$14\frac{1}{5}$
1.27	$5.12\frac{1}{2}$	$14\frac{1}{4}$	$18\frac{1}{3}$	$3\frac{1}{10}$
$1.36\frac{1}{2}$	$19.13\frac{1}{2}$	$13\frac{3}{4}$	$9\frac{2}{3}$	$127\frac{1}{2}$
$.54$	$7.27\frac{1}{2}$	12	$8\frac{1}{6}$	$8\frac{3}{5}$

10. A coal dealer bought 5 carloads of coal containing 27,635, 48,923, 30,704, 62,956, 72,123 lb. of coal respectively. How many pounds did he buy in all? Can you tell how many tons and how many pounds left over were bought by him?

11. Reduce to simplest form:

(1) $\frac{5}{6} + \frac{1}{12}$

(2) $\frac{5}{6} + \frac{5}{12} + \frac{1}{3}$

(3) $\frac{2}{5} + \frac{3}{10} + \frac{1}{2}$

(4) $\frac{3}{8} + \frac{5}{24}$

(5) $\frac{1}{2} + \frac{5}{6} + \frac{5}{24}$

(6) $\frac{3}{8} + \frac{1}{16} + \frac{1}{2}$

12. Henry caught three bass weighing 9 oz., 1 lb. 2 oz., 2 lb. 3 oz., respectively. What did all his fish together weigh?

13. Reduce to simplest form: 37260 − 18599.

14. Work Ex. 19, p. 272, and note your improvement in speed.

15. Subtract:

(1)	*(2)*	*(3)*	*(4)*
$36\frac{2}{3}$	$104\frac{1}{2}$	$726\frac{3}{4}$	$928\frac{1}{2}$
$24\frac{1}{6}$	$52\frac{3}{8}$	$82\frac{5}{12}$	$176\frac{5}{16}$

16. If the record for the running high jump is 6 ft. $5\frac{5}{8}$ in., and Walter can jump 4 ft. 9 in., how much higher must he jump in order to equal the record?

17. A dealer sold 417 lb. of feed in one day, 810 lb. another, and 563 lb. on a third day. He had 2000 lb. at the start. How can he tell how many pounds he has left, without the labor of weighing it? How many pounds has he left?

18. On a certain train were 122 passengers. At successive stations 12 got off, 17 got on, 23 got off, 18 got on. How many passengers were then on the train?

19.

	(a)	*(b)*	*(c)*	*(d)*	*(e)*	*(f)*	*(g)*
(1)	5	12	151	3060	7120	71200	56960
(2)	9	13	242	1638	3276	12012	36036
(3)	12	21	361	2562	5124	10248	30744
(4)	7	22	543	1510	6622	13244	66220
(5)	10	23	472	5000	8280	7219	83724
(6)	20	32	681	1873	6542	11437	51394
(7)	80	33	951	4129	5976	18998	97654

In the preceding table of numbers, multiply each number in the column (*d*) by the number in the same row in column (*a*). Similarly divide (*e*) by (*a*); also (*f*) by (*b*). Multiply (*f*) by (*b*). Divide (*g*) by (*c*).

This drill may be limited at any point, or extended farther if desirable.

20. In the numbers of Ex. 19 find the sum of each column, and then the sum of all the columns. Also find the sum of each row, and then the sum of all the rows. How do the final sums compare?

21. Show by diagrams that $\frac{5}{6} = \frac{10}{12}$. Also that $\frac{3}{8} = \frac{9}{24}$.

22.

Multiply	720	628	591	876	1000
by	$37\frac{1}{2}$	$16\frac{3}{4}$	$17\frac{2}{3}$	$23\frac{5}{6}$	$42\frac{4}{5}$

23. Reduce one fourth plus three eighths less one fourth to its simplest form.

24. Reduce to simplest form:

(*1*) $\frac{2}{3} + \frac{5}{8}$ (*2*) $\frac{3}{8} - \frac{3}{16}$ (*3*) $\frac{3}{20} + \frac{1}{2} - \frac{9}{10} + 1$

25. Reduce to the lowest unit named in each example:

(*1*) 4 bu. 3 pk.
(*2*) 3 lb. 5 oz.
(*3*) 8 rd. 1 yd.
(*4*) 7 da. 13 hr. 16 min.
(*5*) 4 bu. 2 pk. 3 qt.
(*6*) 4 yd. 2 ft. 10 in.

26. Lambert bought 2 bu. 3 pk. of chestnuts at $1.30 per bushel. He sold them at 5 cents a pint. How much did he make?

27. If the amateur record for the running long jump is 24 ft. $7\frac{1}{4}$ in., and Walter can jump 16 ft. 9 in., how much must he increase his jump to equal the record?

28. If a train runs at the rate of 36 mi. an hour, how far will it run between 9:15 A.M. and 2:45 P.M.?

29. If 8 bu. of potatoes cost $4, what will 1 bu. cost? 5 bu.?

30. If 5 T. of hay cost $75, what will 12 T. cost?

31. If 5 T. of hay cost $65, what will 10 T. cost? (Use the short method of solution.) 15 T.? 20 T.?

32. If postal cards sell at 6 for 25¢, tell what 12 cards will cost. 18. 24. 9.

33. How many cards (in Ex. 32) may be bought for 50¢? For 75¢? For $1.50?

34. If $\frac{1}{4}$ of a pie costs 10¢, what does the whole pie cost? (Diagram this.)

35. If $\frac{1}{4}$ of a watermelon costs 15¢, what does the whole melon cost?

36. If $\frac{2}{3}$ of a cake costs 20¢, what does the whole cake cost? (Diagram this.)

37. If $\frac{1}{4}$ of a mile of macadam road costs $800, what does a mile cost? (Diagram this.) 2 mi.? 8 mi.?

38. Reduce $8 \times 127 + 12 \times 127 + 10 \times 127$ to its simplest form in the longer way, and also in the shorter way; compare the amount of work in the two processes.

39. Reduce $12 \times 127 + 36 \times 127 - 28 \times 127$ in the shortest way.

40. In a certain city one school has 17 garden plots, each 12′ × 6′; another school has 23 plots, each 12′ × 6′; a third school has 20 plots, each 12′ × 6′. Find, in the shortest way, the area of all these plots taken together.

41. Reduce 18 + 37 − 29 + 27 + 37 − 29 − 31 + 37 − 27. Is there a short way of getting this result?

42. If I buy coal at $5.50 and sell it at $6.75, how much do I gain on 50 T.?

43. Read and reduce 5 × $75 + 15¢ × 6 − $75 × 4 − 3 × 15¢.

44. Compute in the shortest way (by use of cancellation):

(*1*) $\frac{12 \times 398}{16}$ (*2*) $\frac{15 \times \$4.15}{30}$

45. In a cellar 12′ × 18′ × 6′, how many cubic yards are there? (Use cancellation.)

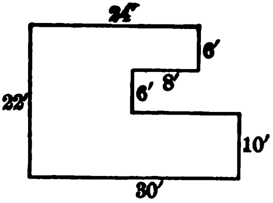
46. If 10 barrels of apples cost $ 25, what will 4 barrels cost? (Use cancellation.)

47. If an orchard of 12 acres produces 350 barrels of pears, how many barrels will an orchard of 18 acres produce?

48. How many square yards of carpet are needed to cover a floor 21 ft. by 24 ft.?

49. A room is 8½ yd. long and 15 ft. wide; find the length of picture molding to go around the room, and its cost at 12¢ a foot.

Also find the area of the floor and the cost of painting it at 10¢ a square yard.



50. Find the area and the perimeter of the figure diagrammed here.

51. Mr. Allen has a square garden, each side of which is 120 ft. Mr. Baker has a rectangular garden 40 ft. wide and 360 ft. long. Draw diagrams of these gardens on some convenient scale, and compare their areas and also their perimeters.

52. A cellar is 12 ft. by 20 ft. by 6 ft. How many cubic feet does it contain? How many bushels of potatoes will it hold? (No. of bushels $= \frac{4}{5}$ no. of cubic feet.)

53. If a cellar is to be 20 ft. wide and 40 ft. long, how deep must it be to hold 6000 bushels of potatoes? (No. of cubic ft $= \frac{5}{4}$ number of bushels.)

54. How many cubic yards of dirt will a wagon body hold which is 9 ft. long, 4 ft. wide, and 3 ft. deep?

55. On squared paper mark off, in as many ways as you can, rectangles whose areas are (*1*) 12 sq. in. (*2*) 15 sq. in. (*3*) 18 sq. in. (*4*) 36 sq. in. (*5*) 27 sq. in.

56. Let the class play the game of drawing to scale, using dimensions which involve both feet and inches, as 4 ft. 6 in.

57. If I sell 8 chickens out of every hundred, how many do I sell out of 4 hundred? Out of 600? 700? 800? 250?

58. Before he used antitoxin, Dr. Williams lost 78 cases of diphtheria out of every hundred cases. After he used antitoxin, he lost only 6 cases out of every hundred. How many cases did he save out of every hundred by the use of antitoxin? How many lives were saved out of 300 cases? Out of 500? 800? 1000? 250? 450?

59. If I borrow $100 and pay $5 for its use for one year, what must I pay for the use of $200? $500? $1200? $250? $360?

60. If I pay $300 for the use of a house for 1 year, how much must I pay for its use for 4 years? 5 years?

61. If I borrow $5000 and pay $300 for its use for 1 year, how much must I pay for its use for 4 years? For 5 years? From Jan. 1 to April 1 of one year?

62. Multiply each of the following:

(1)	*(2)*	*(3)*	*(4)*	*(5)*
623	906	487	689	3125
231	323	514	205	423

63. Mary made a rice pudding, using 1 qt. of milk at 7¢ a qt.; $\frac{1}{4}$ lb. of sugar at 6¢ a lb.; 1 egg at 30¢ a doz.; and other articles amounting to 4¢. What was the cost of the pudding?

64. Divide:

(1) 4173 by 321
(2) 8673 by 413
(3) 16,596 by 503
(4) 5049 by 153
(5) 26,199 by 213
(6) 83,636 by 203

65. Read the following, noting that the sign @ means *at*.

20 lb. sugar @ 5¢
12 lb. coffee @ 30¢
7 qt. milk @ 7¢
8 lb. sausage @ 20¢

Now compute the amount of this bill and find the change that would be received for $10 when paying the bill.

66. Make out a bill to yourself for these articles, using the name of some grocer whom you know.

67. Make up, and solve, an example of your own similar to Ex. 65.

68. Find the price at which each of the following articles is sold at some store in your neighborhood:

1 lb. sugar
1 lb. coffee
¼ lb. tea
1 lb. rice
1 lb. butter
1 loaf bread
1 lb. crackers
1 qt. milk
1 can tomatoes
¼ pk. potatoes
¼ lb. dried beef
1 lb. lamb chops
1 lb. pork chops

Let the class practice making purchases at a store, one pupil acting as cashier (see p. 181, Ex. 8). At first let each pupil buy three articles from which a meal can be made, then 4 articles, then 5 articles, etc.

§ 124. Oral Review

1. Review previous countings.

The teacher should drill the class on those parts of counting in which the class seems to be weak.

2. Count from 1 to 100 by alternate 3's and 2's, thus: "one" (and three) "four" (and two) "six" (and three) "nine" (and two) "eleven," etc.

3. Count from 1 to 100 by alternate 2's and 5's.

The teacher (or pupils) may devise and use similar exercises in counting.

4. Count by 11's from 11 to 132. Recite the multiplication table for 11.

5. Count by 12's from 12 to 144. Recite the multiplication table for 12.

6. Which is larger: 999, or 1001? How do you tell?

7. Add: (*1*) $7+6+5+0+3+2+1+7$.
(*2*) $3+9+5+6+12+5+1$.

8. Let the teacher or pupil put 5 similar rows or columns on the blackboard to be added by pupils.

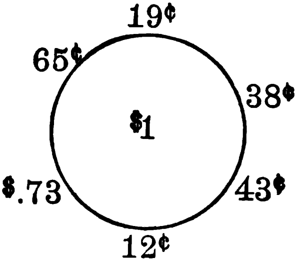
9. Work Ex. 15, p. 227, and Ex. 11, p. 229.

10. Reduce to simplest form:

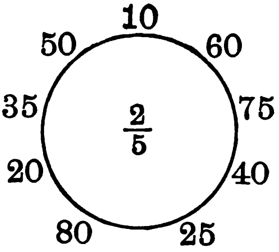
(*1*) $32+21$ (*3*) $77+14$ (*5*) $32-21$ (*7*) $62-25$
(*2*) $56+24$ (*4*) $24+13$ (*6*) $70-54$ (*8*) $85-27$

11. Let the teacher point at some number on the outside of the ring and let the pupil make change for the number inside the ring.

The teacher may vary this drill by changing the number inside the ring to 75¢, $1.50, etc., and also by changing the numbers outside.



12.	Add:	Subtract:	Multiply:	Divide:
(*1*)	$\frac{1}{2}+\frac{1}{4}$	$\frac{1}{2}-\frac{1}{4}$	$2\times\frac{1}{3}$	$2\div\frac{1}{2}$
(*2*)	$\frac{1}{2}+\frac{3}{4}$	$\frac{1}{2}-\frac{3}{8}$	$12\times2\frac{1}{2}$	$4\div\frac{1}{2}$
(*3*)	$\frac{1}{2}+\frac{1}{8}$	$\frac{1}{2}-\frac{1}{5}$	$8\times3\frac{3}{4}$	$4\div\frac{1}{3}$
(*4*)	$\frac{1}{2}+\frac{1}{3}$	$\frac{2}{3}-\frac{1}{2}$	$24\times2\frac{1}{6}$	$4\div\frac{1}{4}$
(*5*)	$\frac{1}{2}+\frac{1}{6}$	$\frac{1}{4}-\frac{1}{6}$	$16\times2\frac{3}{8}$	$3\div\frac{1}{2}$



13. Give $\frac{2}{5}$ of each number outside the ring. Change $\frac{2}{5}$ to $\frac{3}{5}$ or $\frac{4}{5}$.

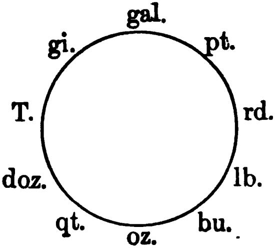
Teacher or pupils may devise similar ring exercises.

14. Which is the greater: $\frac{1}{3}$ of 24, or $\frac{1}{4}$ of 24? $\frac{1}{3}$ or $\frac{1}{4}$ of anything? $\frac{1}{4}$ or $\frac{1}{5}$? $\frac{1}{5}$ or $\frac{1}{6}$?

15. Work at sight the examples on page 187.

16. Work Exs. 21–28, p. 192. Also Exs. 13–22, pp. 199, 200.

17. Give the meaning of each abbreviation or sign on the outside of the ring. Also give as many equivalents as you can for each measure named (as 1 bushel = 4 pecks or 32 quarts).



18. Reduce in the shortest way:

(*1*) $5+5+5+5+5+4$
(*2*) $6+6+6+6+5+5$
(*3*) $8+8+8+8+8+3+4$
(*4*) $7+7+7+3+7+7$
(*5*) $8+8+8+8+8+16$
(*6*) $7+7+7+5+5+5$
(*7*) $9+3+9+3+9+9$

(*8*)	(*9*)
26	52
26	52
26	52
26	52
26	43
32	43
32	43

19. Reduce in the shortest way:

(*1*) $8 \times 17 + 2 \times 17$
(*2*) $12 \times 17 + 8 \times 17$
(*3*) $8 \times 9 + 7 \times 9 + 5 \times 9$
(*4*) $8 \times 17 - 6 \times 17$
(*5*) $18 \times 52 - 8 \times 52$
(*6*) $17 \times 43 + 3 \times 43 - 10 \times 43$

20. Work Exs. 19–23, p. 202, as sight work.

21. If our house has 6 windows in front, 5 windows behind, and 4 windows on each side, how can I tell the number of windows in the house, without counting them?

22. Twenty cars were in the station. 4 went out in one train and 5 in another. How can I tell how many are left, without taking the trouble to count them?

23. If I pay 16¢ for a gallon of vinegar, what ought I to pay for 1 pint? For 2 pints? For 3 pints?

24. If I pay $24 for the use of a certain sum of money for 1 year, what ought I to pay for its use from Jan. 1 to May 1?

25. Mary had a dress made, paying $11 for the cloth, $2 for the trimmings, and $5 for the making. What did the dress cost?

26. Read the following in the order of their size, the largest first: $\frac{1}{5}$, $\frac{1}{2}$, $\frac{1}{10}$, $\frac{1}{3}$, $\frac{1}{4}$.

27. Emily paid a railroad conductor $1.28 for fare between two places 64 miles apart. What was the rate per mile?

28. Draw a diagram of a rectangle 4 in. long and 3 in. wide. Also a rectangle 9 in. long and 4 in. wide. The area of the second is how many times the area of the first?

29. A man buys $100 worth of goods, paying $10 down. How many weeks will it take him to pay for the rest at $15 a week?

How many weeks would it take him if he paid for the rest at the rate of $5 a week?

30. I gave George $\frac{1}{3}$ of a cake and Daniel $\frac{1}{6}$. To how many other children could I give $\frac{1}{6}$ of the cake each?

31. If potatoes are selling at 10¢ a half peck, how much is this a bushel?

32. If I buy a horse for $ 72 and sell him so as to gain $\frac{1}{4}$ of the cost price, what do I sell him for?

33. If you pay 20¢ for a quart of maple sirup, what must you pay for a gallon?

34. At a picnic we ate $1\frac{1}{2}$ doz. bananas, and had $\frac{1}{2}$ doz. left. How many did we have at first?

35. If 100 prime oysters cost 80¢, what will 50 oysters cost? 25 oysters? 75?

36. If the oysters (in Ex. 35) are sold at the rate of 15¢ for 10 oysters on the half shell, what will be the profit on 100 oysters?

37. Walter can throw a baseball 126 ft. and Harry can throw it $7\frac{1}{2}$ ft. farther. How far can Harry throw it?

38. If 7 bananas cost 10¢, what will 21 bananas cost?

39. Margaret has bought 8 yards of ribbon and has used 3 yards. How can she tell how much she has left, without taking the trouble to measure it?

40. A farmer has 120 acres of cleared land. He proposes to plant one fourth of this in corn, one fourth in hay, and to divide the remainder equally between potatoes and tomatoes. How many acres will he have planted with each of these crops?

41. Which is larger: a rug 9 ft. × 3 ft., or one 8 ft. × 4 ft.? How do their perimeters compare?

42. If I buy a horse for $ 150, what must I sell him for in order to gain $ 40?

43. If a man walks 1 mile in 20 minutes, and it takes him 30 minutes to walk a certain road through the woods, how long is the road?

44. If Mary is 14 years old now, how old was she 4 years ago? How old will she be 10 years from now?

45. How long will it take 1 man to do a piece of work, if 4 men take 8 days to do it?

46. If 3 orders can be filled from one pint of ice cream, how many orders will one quart of ice cream fill?

47. If feed for a horse costs 3 ¢ a pound, will a ton cost $ 6 or $ 60?

48. Walter is 4 ft. 7 in. tall. He wants some day to be 6 ft. tall. How many feet and inches will he have to grow?

49. Review such of the sight work in the various sections of Chapter VI as the teacher may select.

§ 125. Review (Mixed Applications)

1. Which is the greater: $\frac{1}{2} \times \frac{2}{3}$, or $2 - \frac{5}{6}$?

2. Find the cost of 18 one-cent, 15 two-cent, 10 three-cent, and 5 five-cent stamps.

3. Find the cost of 3 bags of cattle feed of 100 lb. each, at $1\frac{1}{2}$ ¢ a pound.

4. Draw a line to represent 1 pound and mark off 4 ounces. Treat in the same way 1 week and 2 days; 1 bushel and 1 peck; 1 dollar and 30 cents.

5. Five school lunches cost 15¢, 10¢, 20¢, 25¢, and 15¢. What was the average daily cost?

6. A man buys a house for $3600, pays $1200 down, and agrees to pay the rest of the price in 4 equal installments. How large will each payment be?

7. Miss Annin can write 32 words a minute with the pen and 75 words a minute on the typewriter. How much longer will it take her to write 10,000 words with the pen than with the typewriter?

8. The area of New York State is 49,170 square miles. Make a list of all the states which differ from New York by less than 12,500 square miles in area.

9. Fred's garden plot is 8 ft. by 4 ft. What is its area? If he should increase the length and width each by one half of what it is now, what would the new area be? Draw a diagram showing both rectangles.

10. How many days are there from June 29 to Sept. 3? How many weeks and how many days over?

11. Roger's book contains 350 pages. He has read 187 pages. If he reads 40 pages a day, how many days will it take him to finish reading the book?

12. During the month we have used the telephone 27 times @ 5¢, 8 times @ 10¢, 3 times @ 25¢, and once @ 40¢. What is our telephone bill for the month?

13. Make a problem of your own concerning a postman who started with —— papers, —— letters, and —— packages. After delivering —— pieces of mail, how many did he have left?

14. Make a problem of your own concerning a piece of cloth —— yards long, from which —— yards were sold yesterday, and —— yards the day before, showing the utility of subtraction in finding out how many yards would be left.

15. Write in the briefest form: six thousand seven hundred ninety-six.

16. Reduce to the briefest form: 7 dollars + 5 apples + 8 cows + 16 dimes + 7 cows + 3 apples + 3 half-dollars.

17. A man had in his pocket-book 7 ten-dollar bills, 3 five-dollar bills, 6 half-dollars, 2 dimes, and 3 nickels. He has paid out 3 ten-dollar bills, 6 five-dollar bills, 8 half-dollars, and 6 nickels. Find in the shortest way how much he should have left.

18. Reduce 5 cows + 8 pigs + 7 horses to a single number by changing "cows," "pigs," and "horses" to a more general word.

19. What is the short way of writing 7 units + 8 like units = 15 units of the same kind?

20. How many feet of rope will be required to make a swing 12 ft. high with a seat 2 ft. wide, 1 ft. being allowed on each end to tie the rope to the limb of the tree? On your squared paper draw a diagram or picture of the swing, marking the length of each part.

21. On which will the gain be greater: 280 bushels of wheat sold at a gain of 10 cents a bushel, or 1000 bushels of corn sold at a gain of 3 cents per bushel?

22. If 1 horse can pull 2 tons on a hard, level road, how many horses will be needed to pull 300 tons? If 1 horse pulls 75 tons in a canal boat, how many horses will be needed to pull 300 tons in that way? If a horse costs $ 2 a day, how many dollars are saved per day by use of the canal boat?

23. If a brick is 8″ × 4″ × 2″, how many bricks will it take to fill a space 4′ × 18″ × 3′? (Use cancellation.)

24. 18 boys and 11 girls went on the pond to skate; 9 boys and 4 girls have since returned. How can you tell how many children are on the pond, without counting them?

25. Harriet's father is 42 years old. In what year was he born?

26. By acting as caddie Robert made 17¢, 12¢, 13¢, and 25¢ on successive days. He then spent 50 cents for a cap. How much did he have left to put in the savings bank?

27. If a cow gives 6 qt. of milk twice a day, how much will she give in 30 days? What is this worth at 6¢ a quart?

28. A baseball diamond is 90 ft. square. Draw a diagram of this on the scale of $\frac{1}{4}$ in. to 6 ft. If the pitcher stands 60 ft. from the home plate, mark his position on the diagram.

29. A speaker kept an audience of 500 people waiting for 15 minutes. How much time did the 500 people lose all together? What was this worth at 25¢ an hour?

30. How much must be added to the sum of $ 323 and $ 262 to make $ 1000?

31. There are XXVIII chapters in Philip's book, and he has read through Chapter XIII. How many chapters has he yet to read?

32. If a house rents for $240 a year, what will the rent be from Sept. 1 to Feb. 1?

33. Richard gets 25¢ a week for spending money. In 5 successive weeks he spends 12¢, 13¢, 25¢, 9¢, 17¢. How much does he have left at the end of the 5 weeks to put in the savings bank?

34. If $a = 23$, $b = 31$, $c = 5428$, $d = 2697$, find

(1) $b + c$ *(2)* $c + d$ *(3)* $a + b$ *(4)* $a + d$

(5) $c \div a$ *(6)* $d \div b$ *(7)* $a + c - b + d$ *(8)* $b + c - a + d$

See note, § 122, p. 302.

35. If you had a garden plot 12 ft. long and 8 ft. wide, with what vegetables or flowers would you like to plant it? Draw a diagram, stating the scale of your drawing, and showing how you would divide the plot.

36. A ribbon 4 ft. long will make how many pieces 9 in. long?

37. Which would you rather have: $\frac{4}{6}$ of a cake, or $\frac{1}{2}$ of it? Why?

38. Mary receives 1 egg out of every 4 which she finds. On successive days in one week she found 12, 18, 23, 17, 16, 19, 13 eggs. How many did she receive? What were these worth at 30¢ a dozen?

39. Mr. Morton has a lot of ground 40 ft. × 100 ft. On it is a house 20 ft. × 40 ft., situated 10 ft. from the

front of the lot and equally distant from the two sides of the lot. Draw a diagram of the house and lot which Mr. Morton can send to a friend who is thinking of buying the property.

40. Pace the length of the room. Measure the length of 10 of your paces. How many inches in 1 pace? If you take 462 steps in going from the schoolhouse to your home, how far do you walk? Tell this (*1*) in inches; (*2*) in feet; (*3*) in yards.

41. A farmer took to market 26 dozen eggs worth 28 cents a dozen, and 37 pounds of butter worth 33 cents a pound How much did he receive for these?

42. If we burn 3 pints of oil every night, how long will 3 gallons of oil last us?

43. A newsboy bought 60 papers at $1\frac{1}{4}$¢ each and sold them for 2¢ each. How much did he make?

44. If in a certain city 20 blocks make a mile, how far is it from 12th St. to 62d St.?

45. If a grocer put up 4 pounds of tea in quarter-pound packages, how many packages did he have?

46. If a piece of wire 3 yd. 2 ft. long should be cut into 1-inch pieces, how many pieces would be made? How many 2-inch pieces could be made? 6-inch pieces?

47. The blackboard in our room is 8 ft. × 3 ft. That in the next room is 10 × 2 ft. Which board is larger?

48. Which of the clock faces do you prefer, that on page 101 or that on page 211? Why?

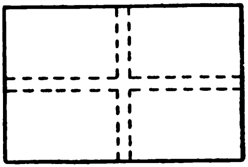
49. If Grace lives 8 blocks from school and it takes her $1\frac{1}{4}$ minutes to walk 1 block, when must she start from home in order to arrive at school at quarter before 9 o'clock? Draw a clock face showing how the clock will look when she starts.

50. What is a fraction? Give an example of one. What is the numerator? What is the denominator? What does the denominator show? What does the numerator show?

51. If 20 acres of land cost $550, what will 16 acres cost?

52. Mr. White has a field 68 rods long and 44 rods wide. If he cuts a road 4 rods wide through the middle of the field each way, how large will each of the 4 pieces be that are left?

If he divides each of these parts into building lots each 4 rods by 10 rods, how many building lots will he have? What will they be worth at $1250 per lot?



Complete the drawing, showing how Mr. White can divide the land into such lots to best advantage.

53. How many more years was it from the discovery of America to the Declaration of Independence, than from the latter date to the present time?

§ 126. Review; Furnishing a Room

1. Amy's room is 21 ft. long and 15 ft. wide. How much would it cost to paint the floor at 10¢ a square yard?

2. If she buys a rug 12 ft. long and 6 ft. wide, how much of the floor will not be covered by the rug? By use of squared paper, draw a diagram of the room showing the rug on the floor.

3. If Amy pays $ 8 for her rug, $ 7.50 for a bedstead and mattress, $ 6.50 for a bureau, $ 3.75 for a rocker, $ 1.25 for each of 3 chairs, $ 4.65 for a desk, what will she pay in all for these articles?

4. Her room has two windows. Would it be easier to bring window shades to the room and select those that would fit, or to measure the windows and go to the store and get shades corresponding to the measurements?

5. If she paid $ 1.23 for each of the window shades and $ 5.20 for pictures, how much did it cost her to furnish her room in all?

6. If you had $ 75 with which to furnish a room, state how you would spend it, giving the current cost of items in your locality. (Would you cover the floor with matting, carpet, or rugs?)

7. Draw a diagram of the room, showing location of door and windows, and how you would arrange the furniture.

8. Let each girl in the class tell how she would spend $ 20 in getting material for a dress and having it made, not forgetting such items of cost as buttons, thread, silk, and braid.

9. Let each boy tell how he would spend $ 20 for a suit, pair of shoes, a hat, and a tie, giving current prices.

§ 127. Review; Keeping a Refreshment Stand

1. Tom, Fred, and Albert kept a refreshment stand on Fair Day. They bought 2 doz. lemons at 20¢ a dozen, 3 lb. sugar at 6¢, and 5 lb. ice at 4¢. They made 2 gal. of lemonade and sold it all at 5¢ a glass. If a glass is $\frac{1}{2}$ pt., how many glasses did they sell and what did they make on lemonade?

2. They bought a bushel of peanuts for $1.40 and paid 25¢ to have them roasted. They sold the peanuts at 5¢ a pint. What did they make on peanuts?

3. Using corn raised in their own garden, they made popcorn balls. They bought 3 quarts of molasses at 16¢ a quart and made 80 balls, which they sold at 2¢ each. How much did they make on popcorn balls?

4. Arrange the cost, proceeds, and gain on items in a table thus:

	Cost	Proceeds	Gain
Lemonade			
Peanuts			
Popcorn Balls			

What was the entire gain?

5. If they broke 2 glasses which cost 5¢ each, and had to pay 20¢ for the use of the other glasses and 50¢ for the use of their stand, what was the final net gain?

6. If each boy kept 50¢ to spend on the school picnic, how much would each have left to put in the bank?

§ 128. Review; A School Picnic

1. If the trolley car has 12 seats on each side of the aisle and each seat holds 2 children, how many children can be seated in the car?

2. If there are 56 children and the teacher, how many children would have to stand if all of them went out to the park in one car to a school picnic?

3. If 6 car tickets cost a quarter, what will be the cost of 2 tickets for the teacher and for each of the children?

4. If the car is 24 ft. long and 6 ft. wide on the inside and the aisle 2 ft. wide, draw a diagram of the floor of the car showing the aisle and seats.

5. If Tom, Fred, Albert, and two other boys hire a boat for an hour for 75¢, what does each pay?

6. If Tom, Fred, and Albert each buys his sister lemonade costing 5¢ and each drinks a glass himself, how much does each boy pay for boat hire and lemonade?

7. If the park is 4 miles from the City Hall and the party must be back at the City Hall at 5:45, when must they leave the park, assuming that the car runs 1 mile in 8 minutes?

TABLES

Linear Measure

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
5½ yards, or 16½ feet = 1 rod (rd.)
320 rods = 1 mile (mi.)
1 mi. = 320 rd. = 1760 yd. = 5280 ft. = 63,360 in.

Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
160 square rods = 1 acre (A.)
1 A. = 160 sq. rd. = 4840 sq. yd. = 43,560 sq. ft.

Cubic Measure

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)

Measures of Capacity

Liquid Measure

4 gills (gi.) = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

Dry Measure

2 pints = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Avoirdupois Weight

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2000 pounds = 1 ton (T.)

TIME

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
12 months (mo.) = 1 year (yr.)

COUNTING

12 units = 1 dozen (doz.)
12 dozen = 1 gross
20 units = 1 score

IMPORTANT NUMERICAL FACTS

(Material for Examples)

DATES

	YEAR
Discovery of America	1492
Settlement of Jamestown	1607
Settlement of Plymouth	1620
Declaration of Independence	1776
Washington's Inauguration	1789
Discovery of Electric Telegraph	1844

DISTANCES

	MILES
From New York to Philadelphia	90
From New York to Washington	228
From New York to Boston	234
From New York to Chicago	912
From New York to San Francisco	3,250
From New York to London	3,375
Diameter of the earth	7,918
Circumference of the earth	25,000

HEIGHTS OF MOUNTAINS

	FEET
Mt. Washington	6,290
Pike's Peak	14,147
Mt. McKinley	20,464
Mt. Everest	29,002

HEIGHTS (OR LENGTHS) OF STRUCTURES

	FEET
Bunker Hill Monument	221
Washington Monument	555
Singer Building (N.Y.)	612
Metropolitan Life Building (N.Y.)	700
Eiffel Tower	984
Length of *Lusitania*	790
Length of *Olympic*	882

LENGTHS OF RIVERS

	MILES		MILES
Hudson	280	Rio Grande	1,800
Ohio	950	Arkansas	2,170
Colorado	1,360	Missouri	3,100
Mississippi	3,160		

RECORDS (YEAR 1910)

100 yd. dash	$9\frac{3}{5}$ sec.
440 yd. dash	47 sec.
1 mile run	4 min. $15\frac{2}{5}$ sec.
Running broad jump	24 ft. $7\frac{1}{4}$ in.
Mile in automobile	$27\frac{1}{3}$ sec.
Transatlantic voyage	4 da. 10 hr. 51 min.

VELOCITIES

Wind	18 miles per hour (av.)
Sound	1090 feet per second (av.)

WEIGHTS

1 CUBIC FOOT	POUNDS
Water	$62\frac{1}{2}$
Stone	160
Iron	480
Lead	700
Gold	1200

Areas

State	Sq. Mi.	State	Sq. Mi.
Alabama	52,250	New Mexico	122,580
Arizona	113,020	New York	49,170
Arkansas	53,850	North Carolina	52,250
California	158,360	North Dakota	70,795
Colorado	103,925	Ohio	41,060
Connecticut	4,990	Oklahoma	70,057
Delaware	2,050	Oregon	96,030
District of Columbia	70	Pennsylvania	45,215
Florida	58,680	Rhode Island	1,250
Georgia	59,475	South Carolina	30,570
Idaho	84,800	South Dakota	77,650
Illinois	56,650	Tennessee	42,050
Indiana	36,350	Texas	265,780
Iowa	56,025	Utah	84,970
Kansas	82,080	Vermont	9,565
Kentucky	40,400	Virginia	42,450
Louisiana	48,720	Washington	69,180
Maine	33,040	West Virginia	24,780
Maryland	12,210	Wisconsin	56,040
Massachusetts	8,315	Wyoming	97,890
Michigan	58,915		
Minnesota	83,365	OUTLYING POSSESSIONS	
Mississippi	46,810	Alaska	590,884
Missouri	69,415	Guam (Ladrones)	210
Montana	146,080	Hawaii	6,449
Nebraska	77,510	Panama Canal Strip	474
Nevada	110,700	Philippine Islands	115,026
New Hampshire	9,305	Porto Rico	3,435
New Jersey	7,815	Samoan Islands	77

At the option of the teacher the pupil may insert other numerical facts for reference on the fly leaves at the end of the book.

ANSWERS

Page 175

4. 1,097
1,426
$ 1,268
1,745 ft.
1,474
10,286
1,663
1,411
1,679
1,425
2,227
2,199

5. 1,941
$ 2,264
1,761 ft.
1,547
2,291
21,185

6. 309 mi.
7. 1,862 mi.

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9. 1799
12. $ 598
10. 679 A.
13. 987
11. $9,798
16. 1,396 ft.

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19. 214 ft.

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3. 155
187
191
141
233
163
233
210
5,212
$ 3,110
1,111
3,111
4,202
3,332
2,632
4,342
1,111
3,154

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5. 147
3,196
2,603
$ 509
2,724
3,205 ft.
967 lb.
3,779
1,719
53,637
1,376

6. 4,532
1,103 ft.
2,240
4,636 yd.
2,284
2,226
7. 1,143
8. 260 A.
11. 168
12. $ 4,450

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13. 67 yr.
14. 1809
16. 429 ft.
17. 111 ft.
18. 381
19. 727
273
20. 9 in.
21. 36 yd.

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3. 10 ¢
4. 14 ¢
5. 19 ¢
6. 44 ¢

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6. $ 1,186.60
7. $ 1,057.00
8. $ 1,175.64
9. $ 698.58
10. $ 44.33
11. $ 40.18
12. 73 ¢
13. 77 ¢

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6. 686
768
1,648

2,288
1,218
3,075

$ 3,025
$ 2,610
$ 3,604
$ 1,674

7. 434
616
1,052

$ 1,820
$ 1,758
4,268

4,152
8,294

8. (1) (× 3) 651
(× 4) 868
(× 5) 1,085

(2) 924
1,232
1,540

(3) 1,578
2,104
2,630

(4) $ 2,730
$ 3,640
$ 4,550

(5) $ 2,637
$ 3,516
$ 4,395

(6) 6,402
8,536
10,670

(7) 6,228
8,304
10,380

(8) 13,941
18,588
23,235

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10. 48
120
96

11. 588 bbl.
784 bbl.
392 bbl.
980 bbl.

12. 900
675
1,125

13. 1,200
720
480

15. $ 432
16. $ 4.24
17. $ 1,280
18. 555 bu.
925 bu.
740 bu.

19. 128 qt.
640 qt.
896 qt.
20. $ 10.75
21. $ 144.00

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22. 480 ft.
23. 360 ft.
24. 6,250 sq. yd.
25. $ 1.43
26. 89 ¢

Page 189

6. (÷ 2) 244
422
242
240
424
402

(÷ 4) 122
211
121
120
212
201

7. 211
203
110
111
210
412

142
101
122
321

8. 123, 1
122, 1
211, 1
111, 1
231, 2
211, 1

212, 1
211, 2
110, 2
201, 2
100, 1
121, 1

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10. 231
122
121
300

102
101
111
110

221
124
312
120

312
211
211
100

12. 212 gal.
120
13. 21
14. 211 yd.
15. 242

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18. (+ 5) 113
133
153
168
168⅘

(÷4) 141¼
166¼
191¼
210
211

(÷ 3) 188⅓
221⅔
255
280
281⅓

(÷ 2) 282½
332½
382½
420
422

19. 292
65
124
213

232
135
241
115⅕

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21. 231¼ gal.
22. 218¾
23. $ 2.50
24. 15

25. 240 yd.
26. 98
65⅓
49
39⅕

27. 42
28. $ 960
$ 750

29. 878
2,155
2,827
$ 203.50
$ 663.20

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30. 2,279
$ 20.84
$ 89.45
$ 162.75
$ 448.63

2. 440 yd.
880 yd.
220 yd.
3,520 yd.
5,280 yd.
4,400 yd.

3. 5,280 ft.
2,640 ft.
1,760 ft.

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4. 880 ft.
5. 56
6. 2,318 mi.
7. 231 rows, 1 man
8. 980 lb.; 245 days
9. $ 1.38
11. $ 21.60; $ 17.28

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4. 50 ¢; 75 ¢; $ 1.00; $ 1.25
5. 20 ¢; 30 ¢; 40 ¢

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6. $ 8.30
$ 12.45

7. 80 ¢
$ 1.20
$ 1.60
$ 2.00
60 ¢
$ 1.00

8. 12; 18
9. 6 qt.; 9 qt.; 12 qt.
10. 6; 9; 12

11. 12 ¢
24 ¢; 36¢
12. $ 4.50
13. 244 bu.

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8. 1,065
1,278
1,704
9. 2,268
2,916
1,944
10. 1,824
3,648
4,104
3,192
11. 1,974
5,264
5,922
12. 4,254
7,799
8,508

13. 1,491
5,642
3,556
4,760
4,984
14. (× 6) 1,278
4,836
3,048
4,080
4,272
(× 8) 1,704
6,448
4,064
5,440
5,696

(× 9) 1,917
7,254
4,572
6,120
6,408
15. 320 rd.
960 rd.
1,920 rd.
2,240 rd.
2,560 rd.
2,880 rd.
16. 1,825 da.
3,285 da.
4,015 da.
4,380 da.

17. 3,828 mi.
6,699 mi.
11,484 mi.
18. 1,764 lb.
2,156 lb.
2,352 lb.
1,372 lb.
19. $ 3,325
$ 4,275
$ 5,700
$ 2,375
20. 15,840 ft.
21,120 ft.

Page 203

4. (1) 111
(2) 101
(3) 110
(4) 101
(5) 31
(6) 31
(7) 60
(8) 21
(9) 103
(10) 103
(11) 102
(12) 104
(13) 60
(14) 70
(15) 102
(16) 101

5. (1) 111$\frac{1}{8}$
(2) 111$\frac{2}{7}$
(3) 101$\frac{1}{8}$
(4) 100$\frac{1}{7}$
(5) 111$\frac{3}{8}$
(6) 101$\frac{1}{9}$
(7) 101$\frac{4}{7}$
(8) 101$\frac{3}{8}$
(9) 110$\frac{5}{8}$
(10) 103$\frac{5}{8}$
(11) 120$\frac{3}{7}$
(12) 111$\frac{1}{8}$

6. 101
7. 102 bu.

Page 204

8. (1) 112
(2) 127
(3) 123
(4) $ 108
(5) 129$\frac{3}{5}$
(6) 122 ft.
(7) 136 in.
(8) 141
(9) 114

9. 113$\frac{1}{8}$
146$\frac{3}{8}$
154$\frac{5}{8}$
146
76$\frac{3}{8}$
131$\frac{5}{8}$
74
141$\frac{5}{8}$

10. (÷7) 97
125$\frac{5}{7}$
132$\frac{4}{7}$
125$\frac{1}{7}$
65$\frac{3}{7}$
112$\frac{5}{7}$
63$\frac{3}{7}$
121$\frac{4}{7}$

(÷8) 84$\frac{7}{8}$
110
116
109$\frac{4}{8}$
57$\frac{2}{8}$
98$\frac{5}{8}$
55$\frac{4}{8}$
106$\frac{3}{8}$

(÷9) 75$\frac{4}{9}$
97$\frac{7}{9}$
103$\frac{1}{9}$
97$\frac{3}{9}$
50$\frac{8}{9}$
87$\frac{6}{9}$
49$\frac{3}{9}$
94$\frac{5}{9}$

11. 112 bu.

Page 210

8. $ 4.50
$ 18
$ 36

14. 2,682
22,305
3,264
$ 348.59

15. $ 1,343
$ 21.14
$ 41.28
$ 62.08

16. 3,365
$ 48.12
$ 63.15
$ 80.35

17. 221
$ 4.01
$ 4.11
$ 101.23

Page 211

18. $ 5.53; $ 1.10; $ 4.43

Page 213

5. $ 2,285.64
$ 259.98
$ 511.37
$ 522.96

6. $ 2,025.66
$ 1,774.27
$ 1,762.68

7. 790 pupils
8. 35 days

11. 1,836
$ 48.20
$ 1,920
$ 42.12

12. $ 105.60
$ 211.20
$ 316.80
$ 264.00

13. $ 316.80
$ 475.20
$ 792.00

Page 214

15. 544$\frac{1}{2}$ mi.
16. 823 mi.

17. 128 yr.
156 yr.
89 yr.

18. 36 sq. rd.
24 rd.

19. 36 sq. rd.
30 rd.
$ 6

Page 215

22. 6 ¢
12 ¢
24 ¢
30 ¢

23. $ 1.00
$ 1.50
$ 2.00
24. 6 ; 9

25. 225
675
1,350
2,025

26. $ 13.50

Page 216

2. $ 10.60
4. 75 ¢ ; $ 1.50

Page 217

5. $ .80
6. 10 pk.
$ 3.00; $ 2.85
7. 120 heads
$ 2.30
8. $ 5.85
9. Peas; $ 11.40

Page 223

7. 4,000 lb.
2 T.
8. 2 T., 400 lb.
2 T., 4 cwt.
9. 6,000 lb.
10,000 lb.
8,000 lb.
16,000 lb.
14,000 lb.
10. 1,000 lb.
500 lb.
400 lb.
250 lb.
1,500 lb.
5,000 lb.
11. $ 12
$ 24
$ 36
$ 48
12. $ 50
$ 75
13. 925 lb.
1,075 lb.

Page 225

4. 15,942
25,285
14,756 ft.
22,891
$ 6,332
5. $ 227.24
$ 210.30
$ 231.49
$ 340.05
$ 186.31
6. 19,393 bu.

Page 226

7. $ 30,259.60
8. 22,384 T.
9. 66,465 sq. mi.
10. 113,775 sq. mi.

Page 228

3. 3,448
325
$ 28.63
13,615 ft.
48,914 mi.
$ 5,029
25,002 ft.
23,765
4. $ 8.10
$ 57.47
$ 17.84
$ 39.24
$ 24.97
$ 142.88
$ 269.96
$ 258.30

Page 229

5. 4,171 tons
6. 2,434 votes
8. 66,465 sq. mi.; 116,460 sq. mi.; 49,995 sq. mi.
9. 1,006 bu.

Page 230

1. 6 ¢
18 ¢
2. $ 6
$ 30
3. $ 36
4. 720 lb.
5. $ 2; $ 3; $ 4

Page 231

6. 18 ¢
7. $ 30
8. 40 ¢
9. 90 ¢
10. 270 bu.
11. $ 132
12. 4,608 mi.
13. 48 ¢
15. $ 135
$ 202.50
$ 607.50

Page 232

7. $ 4 ; $ 12
8. 284 yr.
11. $ 62.50

Page 233

12. 21 ¢
13. 27 ¢
14. 7 qt.; 1 ¢
15. \$ 3
\$ 21

16. 8 mi.
72 mi.
17. \$ 1
\$ 1.25
\$ 2

18. \$ 2
\$ 3
\$ 4
19. 8 lb.
16 lb.

20. 14 blocks
70 blocks

21. 2,539
\$ 2,802
\$ 267.56
\$ 304.92
\$ 103.45

Page 234

22. 1,052; \$ 30.78; 63¢; \$ 12.76; \$ 45.50
23. 5,760; 3,240; 3,860; \$ 62.58; \$ 93.06

24. 840
924
429
1,260
1,008
1,428
$1{,}136\frac{1}{3}$
1,501

25. (÷7) 720
792
$367\frac{5}{7}$
1,080
864
1,224
974
$1{,}286\frac{1}{7}$

(÷8) 630
693
$321\frac{3}{4}$
945
756
1,071
$852\frac{1}{4}$
$1{,}125\frac{3}{8}$

(÷9) 560
616
286
840
672
952
$757\frac{5}{9}$
$1{,}000\frac{1}{3}$

27. 840
144
840
28. $89\frac{1}{3}$
29. $11{,}077\frac{1}{2}$ sq. mi.
23,292 sq. mi.
$12{,}214\frac{1}{2}$ sq. mi.
30. 220 yd.
660 ft.

Page 235

31. \$ 322

32. \$ 200

34. 39 bu.

Page 237

8. 2,240
3,360

\$ 3,800
21,330 in.

496,800
30,000

180,000 ft.
\$ 24,000

\$ 61,500
\$ 105,700

Page 238

9. 720
840
18,320
21,600
121,440
64,000

10. (÷30) 1,080
1,260
27,480
32,400
182,160
96,000

(÷50) 1,800
2,100
45,800
54,000
303,600
160,000

(÷90) 3,240
3,780
82,440
97,200
546,480
288,000

(÷40) 1,440
1,680
36,640
43,200
242,880
128,000

(÷60) 2,160
2,520
54,960
64,800
364,320
192,000

(÷70) 2,520
2,940
64,120
75,600
425,040
224,000

11. 105,600 ft. = 35,200 yd.
158,400 ft. = 52,800 yd.
264,000 ft. = 88,000 yd.
475,200 ft. = 158,400 yd.

12. 12,720 lb.
72,000 lb.

13. 640 sq. ft.
104 ft.

14. The latter; \$ 25.60
15. 480 sheets; \$ 2.40

Page 239

2. 2,756
15,934
$ 16,002
$ 23,040
38,720 ft.
216,480 ft.
8,892
14,400
3,920
15,360

3. 6,636
$ 8,925
36,960 yd.
36,288
110,880 ft.

4. (× 32) 10,112
$ 13,600
56,320 yd.
55,296
168,960 ft.
(× 43) 13,588
$ 18,275
75,680 yd.
74,304
227,040 ft.
(× 51) 16,116
$ 21,675
89,760 yd.
88,128
269,280 ft.
(× 62) 19,592
$ 26,350
109,120 yd.
107,136
327,360 ft.
(× 73) 23,068
$ 31,025
128,480 yd.
126,144
385,440 ft.
(× 93) 29,388
$ 39,525
163,680 yd.
160,704
491,040 ft.

5. 63,360 ft.
163,680 ft.
221,760 ft.
343,200 ft.
443,520 ft.

7. 5,355 bu.
$ 4,284

8. $ 5.25

9. 1,032 sheets

Page 240

13. 672 sq. ft.
14. 1,500 sq. ft.
15. $ 58.32

Page 242

5. $ 37.80
6. $ 50

7. 27,552 bu.
32,267 bu.
51,250 bu.

9. 18,304
$ 87,854
17,286 bu.

10. 14,102 bu.
$ 10,153.44

Page 243

11. $ 12.70
12. $ 6.92
13. $ 750

Page 244

8. $ 7
9. 4 pieces
10. 30 bu.
11. 350 lb.
12. 60 hr.

Page 245

14. (1) $182\frac{2}{30}$
(2) $249\frac{15}{30}$
(3) $230\frac{20}{30}$
(4) $2,898\frac{12}{30}$
(5) $ $23\frac{14}{30}$
(÷ 50) (1) $109\frac{12}{50}$
(2) $149\frac{15}{50}$
(3) $138\frac{20}{50}$
(4) $1,739\frac{2}{50}$
(5) $ 14, rem. $ 4
(÷ 80) (1) $68\frac{2}{80}$
(2) $93\frac{45}{80}$
(3) $86\frac{40}{80}$
(4) $1,086\frac{72}{80}$
(5) $ 8, rem. $ 64
(÷ 90) (1) $60\frac{62}{90}$
(2) $83\frac{15}{90}$
(3) $76\frac{80}{90}$
(4) $966\frac{12}{90}$
(5) $ 7, rem. $ 74
(÷ 20) (1) $273\frac{2}{20}$
(2) $374\frac{5}{10}$
(3) 346
(4) $4,347\frac{12}{20}$
(5) $ 35, rem. $ 4
(÷ 70) (1) $78\frac{2}{70}$
(2) $106\frac{65}{70}$
(3) $98\frac{60}{70}$
(4) $1,242\frac{12}{70}$
(5) $ 10, rem. $ 4

15. (1) $98\frac{24}{70}$
(2) $634\frac{8}{30}$
(3) $190\frac{42}{50}$
(4) $ 235, rem. $ 37
(5) $ 167, rem. $ 10

16. 1320 ft.
22 ft.

17. 104 bu.
and 35 lb.

Page 246

18. $ 20
19. 602 pupils

Page 247

4. (1) 23
(2) 32
(3) 41
(4) 74
(5) 63
(6) 27
(7) 84
(8) 93
(9) 322
(10) 216
(11) 123
(12) 216
(13) 636
(14) 207
(15) 258

5. $ 13
6. 23 bu.
7. $ 22
8. $ 203

Page 248

9. 232$\frac{1}{11}$ bu.

Page 250

9. (1) 423
(2) 215
(3) 113
(4) 217
(5) 211
(6) 221$\frac{7}{11}$
(7) 318
(8) 302
(9) 208

11. (1) 123
(2) 317
(3) 35
(4) 516
(5) 317
(6) 342
(7) 127
(8) 508
(9) 2,156

12. 22$\frac{10}{11}$ bu.
13. $ .13
14. 12 hr.
15. 612 lb.

Page 251

16. $ 6,250
17. $ 230$\frac{10}{13}$ per week
18. 71$\frac{4}{7}$ mi.
19. 67 in.
20. 423 yd.

Page 252

5. 37 mi.
6. $ 68

Page 253

7. 257 lb.
8. 76 in.
12. 45 hr.
66$\frac{6}{25}$ hr.
13. $ 88
14. $ 4.15

Page 254

16. (1) 120$\frac{13}{59}$
(2) 413$\frac{40}{63}$
(3) 2,615
(4) 100$\frac{2}{57}$
(5) 123
(6) 331
(7) 276
(8) 255
(9) 411
(10) 293
(11) 311
(12) 624

17. $ 93$\frac{17}{35}$
18. 68; 188
19. $ 148$\frac{14}{46}$
20. 11 hr.

Page 257

16. 70 cu. yd.; $ 14
17. 280 cu. ft.
18. 64 cu. in.
19. $ 8.64
1. 15,911
22,865
$ 270.20
$ 1,136.23
$ 378.72

Page 258

2. $ 226.21; $ 19.61; $ 130.18; $ 90.84; $ 607.22;

3. (× 3) (1) 21,723
(2) 26,928
(3) $ 60.48
(4) $ 227.82
(5) $ 2,678.34

(× 5) 36,205
44,880
$ 100.80
$ 379.70
$ 4,463.90

(× 9) 65,169
80,784
$ 181.44
$ 683.46
$ 8,035.02

(× 6) 43,446
53,856
$ 120.96
$ 455.64
$ 5,356.68

(× 8) 57,928
71,808
$ 161.28
$ 607.52

$ 7,142.42
(× 7) 50,687
62,832

$ 141.12
$ 531.58
$ 6,249.46

4. (÷ 5) 752$\frac{4}{5}$
1,659$\frac{4}{5}$
14,128$\frac{3}{5}$
$ 4.34$\frac{2}{5}$
$ 42.27$\frac{2}{5}$
$ 187.41$\frac{1}{5}$

(÷ 6) 627$\frac{2}{6}$
1,383$\frac{1}{6}$
11,773$\frac{5}{6}$
$ 3.62
$ 35.22$\frac{5}{6}$
$ 156.17$\frac{4}{6}$

(÷ 7) 537$\frac{5}{7}$
1,185$\frac{4}{7}$
10,091$\frac{6}{7}$
$ 3.10$\frac{2}{7}$
$ 30.19$\frac{4}{7}$
$ 133.86$\frac{4}{7}$

(÷ 8) 470$\frac{4}{8}$
1,037$\frac{3}{8}$
8,830$\frac{3}{8}$
$ 2.71$\frac{4}{8}$
$ 26.42$\frac{1}{8}$
$ 117.13$\frac{2}{8}$

(÷ 9) 418$\frac{2}{9}$
922$\frac{1}{9}$
7,849$\frac{2}{9}$
$ 2.41$\frac{3}{9}$
$ 23.48$\frac{5}{9}$
$ 104.11$\frac{7}{9}$

5. 5,724
8,505
16,416
27,729
$ 73.71
$ 325.35

(× 33) 6,996
10,395
20,064
33,891
$ 90.09
$ 397.65

(× 46) 9,752
14,490
27,968
47,242
$ 125.58
$ 554.30

(× 71) 15,052
22,365
43,168
72,917
$ 193.83
$ 855.55

(× 89) 18,868
28,035
54,112
91,403
$ 242.97
$ 1,072.45

(× 95) 20,140
29,925
57,760
97,565
$ 259.35
$ 1,144.75

(× 74) 15,688
23,310
44,992
75,998
$ 202.02
$ 891.70

6. (÷ 11) 261$\frac{1}{11}$
814$\frac{10}{11}$
472$\frac{2}{11}$
2,476$\frac{10}{11}$
8,158$\frac{8}{11}$
$ 88.53$\frac{1}{11}$

(÷ 14) 205$\frac{1}{7}$
640$\frac{2}{7}$
371
1,946$\frac{1}{7}$
6,410$\frac{3}{7}$
$ 69.56

(÷ 27) 106$\frac{10}{27}$
332
192$\frac{10}{27}$
1,009$\frac{1}{9}$
3,323$\frac{25}{27}$
$ 36.06$\frac{22}{27}$

(÷ 19) 151$\frac{3}{19}$
471$\frac{15}{19}$
273$\frac{7}{19}$
1,434
4,723$\frac{9}{19}$
$ 51.25$\frac{9}{19}$

(÷ 46) 62$\frac{10}{23}$
194$\frac{20}{23}$
112$\frac{21}{23}$
592$\frac{7}{23}$
1,951
$ 21.17$\frac{1}{23}$

(÷ 85) 33$\frac{67}{85}$
105$\frac{39}{85}$
61$\frac{9}{85}$
320$\frac{46}{85}$
1,055$\frac{71}{85}$
$ 11.45$\frac{59}{85}$

(÷ 77) 37$\frac{23}{77}$
116$\frac{32}{77}$
67$\frac{5}{11}$
353$\frac{65}{77}$
1,165$\frac{41}{77}$
$ 12.64$\frac{8}{11}$

(÷ 67) 42$\frac{58}{67}$
133$\frac{53}{67}$
77$\frac{35}{67}$
406$\frac{44}{67}$
1,339$\frac{33}{67}$
$ 14.53$\frac{33}{67}$

(÷ 94) 30$\frac{26}{47}$
95$\frac{17}{47}$
55$\frac{12}{47}$
289$\frac{40}{47}$
954$\frac{35}{47}$
$ 10.36

7. 22,848
129$\frac{1}{72}$
105,742
1,438$\frac{14}{64}$

$ 2,459.60
$ 14.50$\frac{32}{38}$
$ 1,000.96
$ 23.13
250,446

Page 259

10. $ 13
$ 156
$ 819
$ 1,261

11. 20 rd.
330 ft.
111 yd.

12. $25\frac{1}{17}$ sec.

13. 378 mi.
798 mi.

14. 1,550 lb.

15. $32\frac{8}{81}$

16. $80\frac{20}{81}$ cu. ft.

Page 260

1. $ 8.75

3. 72; 12

2. $ 3.75; $ 12.50; $ $1.78\frac{1}{7}$; that is, $1.79.

4. $15\frac{1}{4}$ hr.

Page 261

5. 16 mi. 6. 10 ft. 10 ft. 7. 216 sq. ft.; 24 sq. yd. 8. $ 19.44
9. almost 5 yr. 10. $ 25.83 11. 1,440 cu. in.; 5,760 cu. in. 12. $ 12.50

Page 262

2. 134,784
3. 58,548
4. 503,810
5. 48,625
6. 690,440
7. 2,037,210
8. 782,946
9. 651,768
10. 2,992,326
11. $ 16,236
12. $ 37,800
13. $ 48,600
14. 152,205

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16. 328,848
17. 476,652
18. 838,810
20. 269,280
21. 750,480
22. 571,350
23. $ 601,560
$ 857,780
$ 1,197,550
24. $ 18,576
$ 35,948
$ 37,840

Page 264

2. $43\frac{66}{103}$
3. 58
4. 83
5. 628
6. $106\frac{221}{588}$
7. $1,073\frac{218}{796}$
8. 591
9. 97
10. 804
11. 407
12. 509
13. 753
14. 654
15. $9\frac{238}{858}$
16. $609\frac{64}{858}$
17. 237
18. 27 yr., 145 da.
19. 312
20. 120, rem. $96
21. $13\frac{628}{744}$, or about 14 da.

Page 267

8. (1) 3,780 cu. ft. (2) 1,458 cu. ft. (3) 41,472 cu. in. or 24 cu. ft. (4) 36 cu. ft
(5) 18 cu. ft. (6) 27 cu. ft. 11. 1,428 sq. yd.; 178 yd.; $ 106.80

Page 270

4. 19,021 6. 186 bu.; 6 bu.

Page 271

8. $ 126.36
9. 20
10. 24,618
35,318
$ 288.87
$ 2,978.53
$ 460.74
13. 59
14. 1,581
15. 271
16. 3,981
17. 54
18. 2,659

Page 272

19. $ 333.44 $ 447.08
$ 200.44 $ 75.94
$ 317.05

1. 22 bu.; 704 bu.
2. 1,026$\frac{4}{21}$ bu.
3. $ 9,880
4. 61,625 mi.

Page 273

7. 75 ¢
8. $ 3.58$\frac{1}{3}$, or $3.58
9. 77 bu.
10. 30 ¢; 45 ¢
11. 712
1,424

Page 274

13. 15 ¢ 14. 30 ¢ 15. $ 12 16. 24 ¢; 64 ¢

Page 275

8. 3 quarters; 25c; $1.25

Page 277

20. $\frac{7}{8}$; $\frac{3}{8}$; $\frac{2}{8}$ 21. $\frac{3}{8}$; $\frac{5}{8}$; $\frac{3}{8}$; $\frac{2}{8} = \frac{1}{4}$ 25. $\frac{1}{8}$

Page 278

8. $\frac{1}{6}$; $\frac{3}{6}$ or $\frac{1}{2}$; $\frac{4}{6}$ or $\frac{2}{3}$; $\frac{2}{3}$; $\frac{5}{6}$ 10. $\frac{7}{6}$ or $1\frac{1}{6}$; $\frac{1}{6}$; 1; $\frac{2}{3}$; $\frac{1}{6}$; $\frac{2}{6}$ or $\frac{1}{3}$
11. $\frac{4}{6}$ or $\frac{2}{3}$ ft.; 2 in.; 10 in. 12. $\frac{5}{6}$

Page 279

13. $\frac{4}{6}$ or $\frac{2}{3}$ 16. $\frac{5}{12}$ $\frac{8}{12}$ $\frac{1}{12}$ $\frac{5}{12}$ $\frac{7}{12}$ $\frac{9}{12}$
$\frac{5}{12}$ $\frac{11}{12}$ $\frac{3}{12}$ $\frac{9}{12}$ $\frac{11}{12}$ $\frac{9}{12}$
17. $\frac{5}{12}$ 18. $\frac{8}{12}$

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8. $\frac{5}{10}$ 9. $\frac{4}{10}$ 10. 50 ¢; 15 ¢; 20 ¢

Page 282

7. $\frac{1}{3}$ $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{3}{4}$
$\frac{1}{4}$ $\frac{5}{6}$ $\frac{1}{3}$ ft. $\frac{2}{3}$ ft. $ $\frac{1}{2}$
$\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{4}$ ft. $\frac{1}{3}$ ft. $\frac{1}{2}$ ft.
8. $\frac{2}{6}$ or $\frac{1}{3}$ 9. $\frac{6}{8}$ or $\frac{3}{4}$ 10. $\frac{2}{8}$ or $\frac{1}{4}$
11. $\frac{15}{24}$ 3. $\frac{2}{7}$; $\frac{1}{8}$ in. ; $\frac{1}{12}$ ft. ; $\frac{2}{7}$ yd.

Page 283

5. $\frac{1}{10}$ $\frac{1}{12}$ $\frac{1}{8}$ $\frac{1}{12}$
6. $\frac{1}{6}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ ft. $ $\frac{1}{10}$ $\frac{1}{10}$ 7. $\frac{1}{10}$ $\frac{1}{8}$ $\frac{1}{12}$ $\frac{6}{21}$ $\frac{5}{60}$
$\frac{1}{12}$ $\frac{1}{10}$ $\frac{1}{12}$ $\frac{1}{12}$ ft. $\frac{2}{12}$ $\frac{1}{20}$ $\frac{1}{6}$ $\frac{3}{10}$ $\frac{1}{12}$ $\frac{2}{20}$ $\frac{3}{48}$
8. $\frac{2}{20}$ 9. $\frac{3}{24}$ 11. 4 16 4 18
6 32 6 32

Page 284

3. $18 32¼ 14⅛ 4. 99⅝ 179⅛ 12⅚
$ 8 82¼ 20 7/12 111⅜ 18¼ T. 10 11/12

Page 285

5. 11 6. 23 gal. 11. 4⅓ 12. 1 2/15 13. 14¾
15¾ 7. 10 yd. 12½ 1⅙ 15⅓
46½ 8. 80¼ A. 6¼ 2 3/10 50⅛
10⅚ 9. 9 T. 15⅔ 3⅙ 11 3/10
42⅘ 10. 650½ ft. 15⅛ 14½ 12 5/12
57⅞

Page 286

15. 16½ ft. 16. 1¼ in. 5. 618 1,105 884
4½ ft. 1¼ in. 747 640 5,244

Page 287

6. $ 1.44 7. 15 mi. 8. 448 bu.; $ 425.60 9. $ 399; $ 364.80

Page 288

12. $ 645 13. 66 ¢ 16. 130 ft. 20. $ 9 22. 16½ ft
324 34 ¢ 18. $ 4.50 50 ¢ 5,280 ft.
1,476 14. $ 4.38 $ 4.05 21. 5¼ yd. 10,560 ft.
6,160 15. $ 7.26 19. $ 7.92 1,760 yd. 1,650 ft.
1,640 26¢
302,479

Page 289

23. 900 ft. 24. 1,045 sq. ft. 25. $ 35.10 26. $ 13.50 27. $ 140

Page 290

6. $ 90 7. 72 ¢ 8. 42 ¢ 9. $ 204

Page 291

80 ¢ 11. $ 9,600 12. 105 times 13. 22 ¢ 14. 30 ¢

Page 292

20 ¢ 8. 3 gal. 3 gal. 3 qt. 3 gal. 1 pt.
60 ¢ 3 gal. 3 qt. 5 gal. 1 gal. 1 qt. 1 pt.

Page 293

9. 7 pt. 12 pt. 10. 6 gal. 3 qt.
11 pt. 25 pt. 16. 2 bu. 2 pk.

Page 294

17. 2 bu. 1 pk. 2 bu. 2 pk.
3 bu. 4 qt. 2 bu. 1 pk. 2 qt.

18. 43 qt. 96 qt.
35 qt. 129 qt.

19. 2 qt. 1 pt.

20. 8 days

Page 295

4. $ 27; $ 22$\frac{1}{2}$; $ 31$\frac{1}{2}$

5. 15 days; 16 ¢

6. $\frac{5}{16}$ lb.

7. $ 2.64

9. $\frac{3}{8}$ lb.; 6 oz.

10. 1$\frac{3}{16}$ lb.; 19 oz.

11. 8 lb.; 2 lb.; $\frac{1}{2}$ lb

Page 296

13. 30 in.
84 in.
90 in.
1,060 rd.

14. 66 ft.
49$\frac{1}{2}$ ft.

15. 8 times

16. 9,600 ft.
3,200 yd.

17. 3,520 ft.
1,320 ft.
4,400 ft.

18. 2,640 ties
$ 19.80

19. 64 ¢; 66 ¢; 32 ¢

Page 297

2. 32 sq. ft.
344 sq. in.
5,472 sq. in.
13,824 sq. in.
6,480 sq. ft.

3. 21,780 sq. ft.
10,890 sq. ft.
32,670 sq. ft.
2,420 sq. yd.
1,210 sq. yd.
3,630 sq. yd.

4. less
more

5. 216 sq. ft.
24 sq. yd.
$ 30

7. 33 ft.

8. 18,000 sq. ft.
17,600 sq. ft.

Page 298

10. 81 cu. ft.
108 cu. ft.
135 cu. ft.

11. 15,552 cu. in.
15,672 cu. in.

12. 4 cu. yd.
20 cu. ft.

13. $\frac{4}{9}$ cu. yd.
12 cu. ft.

14. 3,024 cu. ft.
112 cu. yd.
112 cart loads
$ 11.20

15. 96 cu. ft.
192 cu. ft
432 cu. ft.

16. 42,000 lb.; 21 tons

Page 299

17. 1536 bu.

18. 51$\frac{1}{3}$ hr.

2. 2,272 sec.
255 min.
7,212 sec.
11,108 sec.

3. 40 min.

4. 3 yr. 3 mo.
50 hr.
41 min. 40 sec.
9 hr. 43 min. 20 sec.

Page 300

8. 24$\frac{4}{5}$ ft.

9. 66 ¢; $ 2

10. 90 ¢; $ 1.44

13. 41 doz.; 36$\frac{5}{12}$ doz.

14. $ 3.89

15. 3 ¢; 21 ¢; 57 ¢

Page 301

16. Same

17. Same

Page 305

6. 22 pages
7. 250,139

9. \$ 9.90
\$ 36.16
$59\frac{1}{2}$
46
$153\frac{5}{6}$

10. 242,341 lb.; 121 T. 341 lb.

11. $\frac{11}{12}$
$1\frac{7}{12}$
$1\frac{1}{6}$
$\frac{7}{12}$
$1\frac{11}{12}$
$\frac{11}{16}$

Page 306

12. 3 lb. 14 oz.
13. 18,661
15. $12\frac{1}{2}$
$52\frac{1}{8}$
$644\frac{1}{3}$
$752\frac{5}{16}$
16. 1 ft. $8\frac{5}{8}$ in.
17. 210 lb.
18. 122

19.

(1)	(2)	(3)	(4)	(5)
15,300	1,424	$5,933\frac{1}{3}$	854,400	377 [illegible]
14,742	364	924	156,156	$148\frac{10}{11}$
30,744	427	488	215,208	85 [illegible]
10,570	946	602	291,368	121 [illegible]
50,000	828	313 [illegible]	166,037	177 [illegible]
37,460	$327\frac{1}{10}$	357 [illegible]	365,984	75 [illegible]
330,320	$74\frac{7}{10}$	575 [illegible]	626,934	102 [illegible]

Page 307

20.

(1)	(2)
143	138,508
156	53,226
3,401	49,072
19,772	88,168
42,940	104,728
144,358	71,979
422,732	127,821
633,502 (final sum)	633,502 (final sum)

22. 27,000
10,519
10,441
20,878
42,800
23. $\frac{2}{3}$
24. $1\frac{7}{24}$
$\frac{3}{16}$
$\frac{3}{4}$

25. 19 pk.
53 oz.
45 yd.
10,876 min.
147 qt.
178 in.
26. \$ $5.22\frac{1}{2}$ gain

Page 308

27. 7 ft. $10\frac{1}{2}$ in.
28. 198 mi.
29. 50 ¢
\$ 2.50
30. \$ 180

31. \$ 130
\$ 195
\$ 260

32. 50 ¢
75 ¢
\$ 1.00
$37\frac{1}{2}$ ¢
33. 12; 18; 36

34. 40 ¢
35. 60 ¢
36. 30 ¢

37. \$ 3,200
\$ 6,400
\$ 25,600
38. 3,810
39. 2,540

Page 309

40. 4,320 sq. ft.
41. 40
42. \$ $62\frac{1}{2}$

43. \$ 75.45
44. $298\frac{1}{2}$
\$ $2.07\frac{1}{2}$

45. 48 cu. yd.
46. \$ 10
47. 525 bbl.
48. 56 sq. yd.

49. 81 ft.
\$ 9.72
\$ 4.25
$42\frac{1}{2}$ sq. yd.

Page 310

50. 540 sq. ft. area
120 ft. perimeter
51. areas same
Mr. A. per. 480 ft.
Mr. B. per. 800 ft.

52. 1,440 cu. ft.
1,152 bu.
53. $9\frac{3}{4}$ ft.
54. 4 cu. yd.

57. 32
48
56
64
20

58. 72
216
360
576
720
180
324

Page 311

59. \$ 10
\$ 25
\$ 60
\$ 12½
\$ 18

60. \$ 1,200
\$ 1,500

61. \$ 1,200
\$ 1,500
\$ 75

62. 143,913
292,638
250,318
141,245
1,321,875

63. 15 ¢

64. 13
21
$32\frac{500}{508}$
33
123
412

65. \$ 6.69
\$ 3.31

Page 317

1. $2 - \frac{5}{8}$ is greater
2. \$ 1.03
3. \$ 4.50

Page 318

5. 17 ¢
6. \$ 600
7. $179\frac{1}{8}$ min.
9. 32 sq. ft.
72 sq. ft.
10. 66 da.; 9 wk. 3 da.
11. $4\frac{3}{40}$ da.
12. \$ 3.30

Page 319

16. \$ 10.10 + 8 apples + 15 cows
17. \$ 24.05
20. 28 ft.
21. gain on corn

Page 320

22 150 horses
4 horses
\$ 292 saved

23. 486 bricks
26. 17 ¢
27. 360 qt.
\$ 21.60
29. 125 hr.
\$ 31.25
30. \$ 415

Page 321

31. 15 chap.
32. \$ 100
33. 49 ¢

34. 5,459
8,125
54
2,720
236
87
8,117
8,133

36. $5\frac{1}{3}$ p.
38. 29 eggs
72½ ¢

Page 322

41. \$ 19.49
42. 8 nights
43. 45 ¢
44. 2½ mi.
45. 16 pack.
46. 132; 66; 22
47. First is larger

Page 323

49. 8.35 o'clock
51. \$ 440
52. 32 rd. × 20 rd.; 64 lots; \$ 80,000

Page 324

1. $ 3.50 2. 243 sq. ft. or 27 sq. yd. 3. $ 34.15

Page 325

5. $ 41.81 1. 32 glasses; 82 ¢ gained

Page 326

2. $ 1.55 gained on peanuts
3. $ 1.12 gained on popcorn balls
4. $ 3.49 entire gain
5. $ 2.69 net gain
6. 39⅓ ¢ in bank
1. 48 children

Page 327

2. 9 children stand 3. $ 4.75 5. 15 ¢
6. 25 ¢ 7. 5.13 o'clock